

VMS Local Area VAXcluster Manual

Order No. AA-JP20C-TE

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VMS

Local Area VAXcluster Manual

Order Number: AA-JP20C-TE

June 1987

The *VMS Local Area VAXcluster Manual* explains the procedures for setting up a Local Area VAXcluster configuration.

Revision/Update Information: This manual supersedes the VMS Version 4.5C *VMS Local Area VAXcluster Manual*.

Operating System and Version: VMS Version 4.6

Software Version: Local Area VAXcluster Software Version 1.2

June 1987

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This document was prepared using VAX DOCUMENT, Version T1.0

Contents

| | |
|---|-------------|
| PREFACE | ix |
| <hr/> | |
| CHAPTER 1 INTRODUCTION TO THE LOCAL AREA VAXCLUSTER ENVIRONMENT | 1-1 |
| 1.1 BOOT AND SATELLITE NODE FUNCTIONS | 1-1 |
| 1.2 TYPICAL CONFIGURATIONS | 1-2 |
| 1.3 PLANNING CLUSTER SETUP OPERATIONS | 1-6 |
| <hr/> | |
| CHAPTER 2 INSTALLATION, SECURITY, AND NETWORK TAILORING | 2-1 |
| 2.1 INSTALLING AND UPGRADING THE OPERATING SYSTEM | 2-1 |
| 2.2 INSTALLING THE LOCAL AREA VAXCLUSTER SOFTWARE KEY AND CONFIGURING THE BOOT NODE FOR CLUSTER OPERATION | 2-2 |
| 2.3 SECURING THE CLUSTER | 2-4 |
| 2.3.1 Maintaining Cluster Security Data _____ | 2-5 |
| 2.3.2 Controlling Conversational Bootstrap Operations _____ | 2-7 |
| 2.4 INSTALLING THE DECNET-VAX KEY, AND TAILORING AND STARTING THE NETWORK | 2-8 |
| 2.5 CONFIGURING AN EXTENDED CLUSTER | 2-11 |
| 2.5.1 Coordinating Cluster Common Files _____ | 2-11 |
| 2.5.2 Starting the DECnet-VAX Network and MicroVMS Workstation Software in a Configuration with Two System Disks ____ | 2-13 |
| 2.5.3 Updating the Cluster Authorization File in a Configuration with Two System Disks _____ | 2-13 |

| | | |
|-------|--|------|
| 2.5.4 | Setting Up a Second System Disk on a Cluster Boot Node | 2-14 |
| 2.5.5 | Installing New Layered Products on a Boot Node with a Second System Disk | 2-16 |
| 2.5.6 | Configuring a Second Boot Node in an Existing Cluster | 2-17 |
| 2.5.7 | Setting Up a New Cluster with Two Boot Nodes | 2-18 |

CHAPTER 3 CONFIGURING SATELLITE NODES IN THE CLUSTER 3-1

| | | |
|-------|---|------|
| 3.1 | PREPARING TO EXECUTE SATELLITE_CONFIG.COM | 3-3 |
| 3.1.1 | Setting Up Page and Swap Files | 3-4 |
| 3.1.2 | Maintaining Network Configuration Data | 3-5 |
| 3.2 | ADDING A SATELLITE NODE TO THE CLUSTER | 3-6 |
| 3.3 | REMOVING A SATELLITE NODE FROM THE CLUSTER | 3-9 |
| 3.4 | MODIFYING A MICROVAX II OR VAXSTATION II SATELLITE NODE'S ETHERNET HARDWARE ADDRESS | 3-11 |
| 3.5 | CONTROLLING CLUSTERWIDE BROADCAST MESSAGES | 3-12 |
| 3.6 | ENABLING CLUSTER ALIAS OPERATIONS | 3-13 |
| 3.7 | SETTING UP MSCP-SERVED LOCAL DISKS | 3-13 |

CHAPTER 4 GUIDELINES FOR SATELLITE NODE USERS 4-1

| | | |
|-----|---|-----|
| 4.1 | JOINING AND LEAVING THE CLUSTER | 4-1 |
| 4.2 | PERFORMING OPERATIONS THAT AFFECT OTHER USERS | 4-1 |
| 4.3 | IDENTIFYING AND REPORTING PROBLEMS | 4-2 |

APPENDIX A INSTALLING THE OPERATING SYSTEM ON MICROVAX II OR VAXSTATION II BOOT NODES **A-1**

APPENDIX B UPGRADING THE OPERATING SYSTEM ON MICROVAX II OR VAXSTATION II BOOT NODES **B-1**

| | | |
|------------|--|------------|
| B.1 | SYSTEM UPGRADE CONTINGENCIES | B-1 |
| B.2 | PREPARING TO UPGRADE THE OPERATING SYSTEM | B-2 |
| B.3 | PERFORMING THE UPGRADE | B-4 |
| B.3.1 | Upgrade Phase 1 | B-6 |
| B.3.2 | Upgrade Phase 2 | B-7 |
| B.3.3 | Upgrade Phase 3 | B-7 |
| B.3.4 | Upgrade Phase 4 | B-8 |
| B.3.5 | Upgrade Phase 5 | B-8 |

APPENDIX C RELEASE NOTES **C-1**

| | | |
|------------|---|------------|
| C.1 | UPDATING SYS\$SYSTEM:MODPARAMS.DAT FILES WHEN UPGRADING AN EXISTING LOCAL AREA VAXCLUSTER CONFIGURATION TO VERSION 4.6 | C-1 |
| C.2 | MAINTAINING MODPARAMS.DAT FILES | C-2 |
| C.3 | OBSERVING ETHERNET CONFIGURATION RESTRICTIONS | C-2 |
| C.4 | REBOOTING A SATELLITE NODE WITH AN OPERATING SYSTEM ON A LOCAL DISK | C-2 |
| C.5 | DEFINING THE LOGICAL NAME MOM\$LOAD AS A SEARCH LIST AFTER INSTALLATION OF DECSERVER TERMINAL SERVER SOFTWARE | C-3 |
| C.6 | RESPECIFYING CLUSTER GROUP NUMBERS | C-3 |

| | | |
|--------|---|-----|
| C.7 | ADJUSTING RECNXINTERVAL PARAMETER TO BOOT VAXSTATION II/GPX SYSTEMS FROM CONSOLE TERMINAL PORT | C-4 |
| C.8 | LOADING THE MASS STORAGE CONTROL PROTOCOL (MSCP) SERVER ON SATELLITE NODES | C-4 |
| C.9 | USING AUTOGEN TO MODIFY MASS STORAGE CONTROL PROTOCOL (MSCP) SERVER VALUES | C-4 |
| C.10 | ERROR AND WARNING MESSAGES TO BE IGNORED | C-5 |
| C.10.1 | Upgrading the Operating System on Existing Boot Nodes Running VMS Version 4.5A or 4.5C | C-5 |
| C.10.2 | Booting a Satellite Node During SATELLITE_CONFIG.COM ADD Phase | C-6 |
| C.10.3 | Shutting Down a Satellite Node During SATELLITE_CONFIG.COM ADD Phase | C-6 |
| C.10.4 | Booting a Workstation Node before MicroVMS Workstation Software Is Installed | C-7 |
| C.10.5 | Starting the DECnet-VAX Network on MicroVAX II Or VAXstation II Boot Nodes before Adding Satellites | C-7 |
| C.10.6 | Breaking Port-To-Port Virtual Circuit Connections | C-7 |
| C.10.7 | Running the User Environment Test Package (UETP) Ethernet Test | C-8 |

EXAMPLES

| | | |
|-----|--|------|
| 2-1 | Sample Interactive BOOT_CONFIG.COM CONFIGURE Session | 2-4 |
| 2-2 | Sample Interactive Cluster_Authorize Session | 2-7 |
| 2-3 | Sample Interactive Network Configuration Session | 2-9 |
| 2-4 | Sample Interactive BOOT_CONFIG.COM ADD Session | 2-15 |
| 3-1 | Sample NETNODE_UPDATE.COM File | 3-6 |
| 3-2 | Sample Interactive SATELLITE_CONFIG.COM ADD Session | 3-7 |
| 3-3 | Sample Interactive SATELLITE_CONFIG.COM REMOVE Session | 3-10 |
| 3-4 | Sample Interactive SATELLITE_CONFIG.COM MODIFY Session | 3-12 |

FIGURES

| | | |
|-----|--|-----|
| 1-1 | Local Area VAXcluster Configuration with One Boot Node and One System Disk _____ | 1-3 |
| 1-2 | Local Area VAXcluster Configuration with One Boot Node and Two System Disks _____ | 1-4 |
| 1-3 | Local Area VAXcluster Configuration with Two Boot Nodes and Two System Disks _____ | 1-5 |

TABLES

| | | |
|-----|---|-----|
| 2-1 | Summary of Cluster_Authorize Utility Commands _____ | 2-6 |
| 3-1 | Operations Automated by SATELLITE_CONFIG.COM _____ | 3-2 |
| 3-2 | Data Required by SATELLITE_CONFIG.COM _____ | 3-3 |
| A-1 | Installation Procedure Terms _____ | A-1 |
| A-2 | Determining Names for Load-Device and System-Device _____ | A-2 |

TABLE 1

| | |
|----|-----------------------------------|
| 1 | Number of fish caught in the trap |
| 2 | Number of fish caught in the trap |
| 3 | Number of fish caught in the trap |
| 4 | Number of fish caught in the trap |
| 5 | Number of fish caught in the trap |
| 6 | Number of fish caught in the trap |
| 7 | Number of fish caught in the trap |
| 8 | Number of fish caught in the trap |
| 9 | Number of fish caught in the trap |
| 10 | Number of fish caught in the trap |

TABLE 2

| | |
|----|-----------------------------------|
| 1 | Number of fish caught in the trap |
| 2 | Number of fish caught in the trap |
| 3 | Number of fish caught in the trap |
| 4 | Number of fish caught in the trap |
| 5 | Number of fish caught in the trap |
| 6 | Number of fish caught in the trap |
| 7 | Number of fish caught in the trap |
| 8 | Number of fish caught in the trap |
| 9 | Number of fish caught in the trap |
| 10 | Number of fish caught in the trap |

Preface

The *VMS Local Area VAXcluster Manual* is a conceptual and tutorial guide that provides the cluster manager with information needed to

- Understand the Local Area VAXcluster environment.
- Perform installation, security, and network tailoring operations.
- Perform various satellite configuration functions using the command procedure `SATELLITE_CONFIG.COM`.

Intended Audience

This document is intended primarily for users who are responsible for setting up a Local Area VAXcluster configuration and who have VMS system management experience. The document also presents guidelines to help users of satellite nodes function effectively in the cluster environment.

Document Structure

The *VMS Local Area VAXcluster Manual* contains four chapters and three appendixes.

Chapter 1, *Introduction to the Local Area VAXcluster Environment*, presents an overview of the cluster environment and discusses basic setup issues.

Chapter 2, *Installation, Security, and Network Tailoring*, explains how to perform these operations.

Chapter 3, *Configuring Satellite Nodes in the Cluster*, explains how to add and remove satellite nodes, and how to modify the Ethernet hardware address for MicroVAX II and VAXstation II satellites, using the `SATELLITE_CONFIG.COM` command procedure.

Chapter 4, *Guidelines for Satellite Node Users*, provides suggestions for users working in the Local Area VAXcluster environment.

Appendix A, *Installing the Operating System on MicroVAX II or VAXstation II Boot Nodes*, explains procedures for installing the operating system on these nodes.

Appendix B, *Upgrading the Operating System on MicroVAX II or VAXstation II Boot Nodes*, explains procedures for upgrading the operating system on these nodes.

Preface

Appendix C, Release Notes, contains information of interest to cluster managers.

Associated Documents

This manual does not describe day-to-day system management operations, such as establishing user accounts, setting up queues, monitoring performance, and so forth. Nor does it discuss routine network management issues. For information on those topics, refer instead to the following documents:

- *VAX/VMS System Manager's Reference Manual*
- *Guide to VAXclusters*
- *Guide to VAX/VMS Performance Management*
- *VAX/VMS Networking Manual*
- *VAX/VMS Utility Reference Manuals*

Conventions

| Convention | Meaning |
|---|--|
| RET | A symbol with a one- to three-character abbreviation indicates that you press a key on the terminal, for example, RET . |
| CTRL/x | The phrase CTRL/x indicates that you must press the key labeled CTRL while you simultaneously press another key, for example, CTRL/C, CTRL/Y, CTRL/O. In examples, this control key sequence is shown as ^x, for example, ^C, ^Y, ^O, because that is how the system echoes control key sequences. |
| \$ SHOW TIME 15-JUN-1987 11:55:22 | Command examples show in black letters all output lines or prompting characters that the system prints or displays. All user-entered commands are shown in red letters. |

Preface

| Convention | Meaning |
|-----------------------------------|---|
| \$ TYPE MYFILE.DAT . . . | Vertical series of periods, or ellipsis, means either that not all the data that the system would display in response to the particular command is shown or that not all the data a user would enter is shown. |
| file-spec, . . . | Horizontal ellipsis indicates that additional parameters, values, or information can be entered. |
| [logical-name] | Square brackets indicate that the enclosed item is optional. (Square brackets are not, however, optional in the syntax of a directory name in a file specification or in the syntax of a substring specification in an assignment statement.) |
| quotation marks apostrophes | The term quotation marks is used to refer to double quotation marks ("). The term apostrophe (') is used to refer to a single quotation mark. |

1

Introduction to the Local Area VAXcluster Environment

Using Ethernet as the common interconnect, Local Area VAXcluster Software extends many benefits of the VAXcluster architecture to MicroVAX II, MicroVAX 2000, VAXstation II, and VAXstation 2000 systems.

A single Ethernet may support multiple Local Area VAXcluster configurations,¹ each identified and secured by a unique *group number* and a *cluster password*. (For information on cluster security, see Section 2.3.)

This chapter presents an overview of the Local Area VAXcluster environment. Chapters 2 and 3 explain software installation and cluster configuration procedures. Chapter 4 provides guidelines for users of cluster resources. Cluster managers may want to modify or supplement these guidelines to suit local conditions.

1.1 Boot and Satellite Node Functions

A Local Area VAXcluster configuration consists of one or two *boot nodes* and up to 26 *satellite nodes*.

- A *boot node* is both a management center for the cluster and a major resource provider. Its system disk contains the cluster common files for startup, authorization, and queue setup, as well as the directory roots from which the satellite nodes are booted. (The cluster manager creates these directory roots—one for each satellite—using the SATELLITE_CONFIG.COM command procedure, described in Chapter 3.)

A boot node makes available to the cluster such resources as user and application data disks, printers, and distributed batch processing facilities.

In a Local Area VAXcluster configuration, a boot node may be any VAX system except VAX-11/725 or VAX-11/730, or it may be one of the following MicroVAX II or VAXstation II systems:

- MicroVAX II with an RA series system disk.
- MicroVAX II with an RD54 system disk, or VAXstation II with an RD54 or any larger system disk. Note that these boot nodes support a maximum of three satellites. In addition, it is recommended that the satellites use local RD series disks for paging and swapping.

¹ Subject to restrictions listed in Section C.3.

- The *satellite nodes* are booted remotely from a boot node's system disk. Generally, these nodes are consumers of cluster resources, though they may also sometimes provide disk serving and batch processing resources. If satellite nodes are equipped with RD series disks, they may, for enhanced performance, use such local disks for paging and swapping. Satellite nodes may be any of the following:
 - MicroVAX II
 - MicroVAX 2000
 - VAXstation II
 - VAXstation 2000
 - VAXstation II/GPX
 - VAXstation II/RC

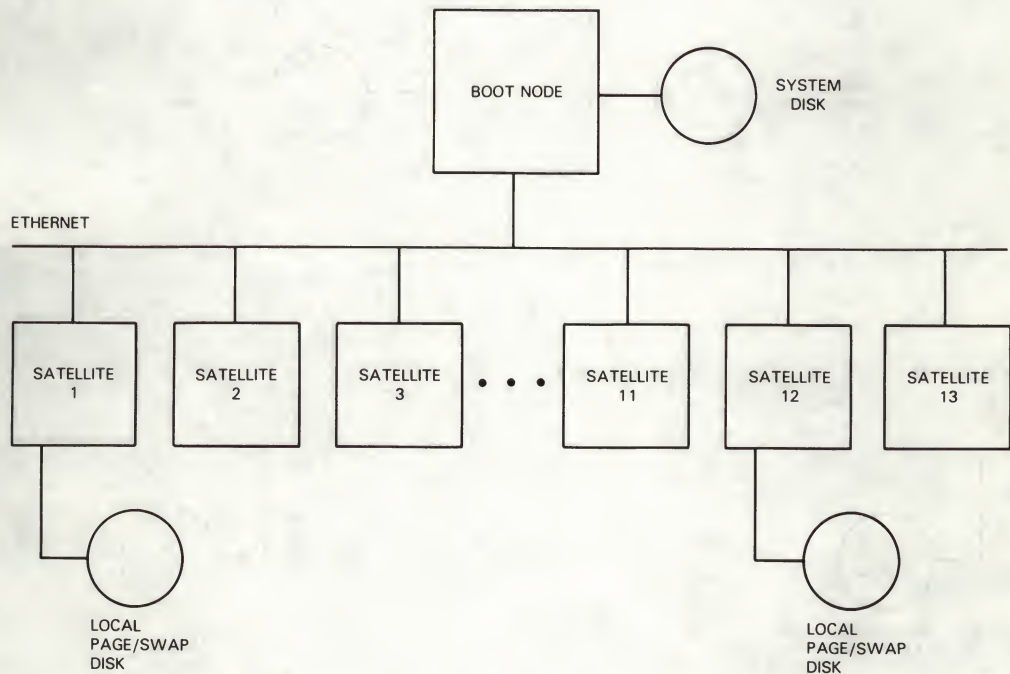
Caution

All MicroVAX II and VAXstation II machines in a Local Area VAXcluster configuration must use Revision E (or later) QBUS Network Adapter (DEQNA) devices and must have at least 3MB memory. Diskless machines require at least 4MB memory.

1.2 Typical Configurations

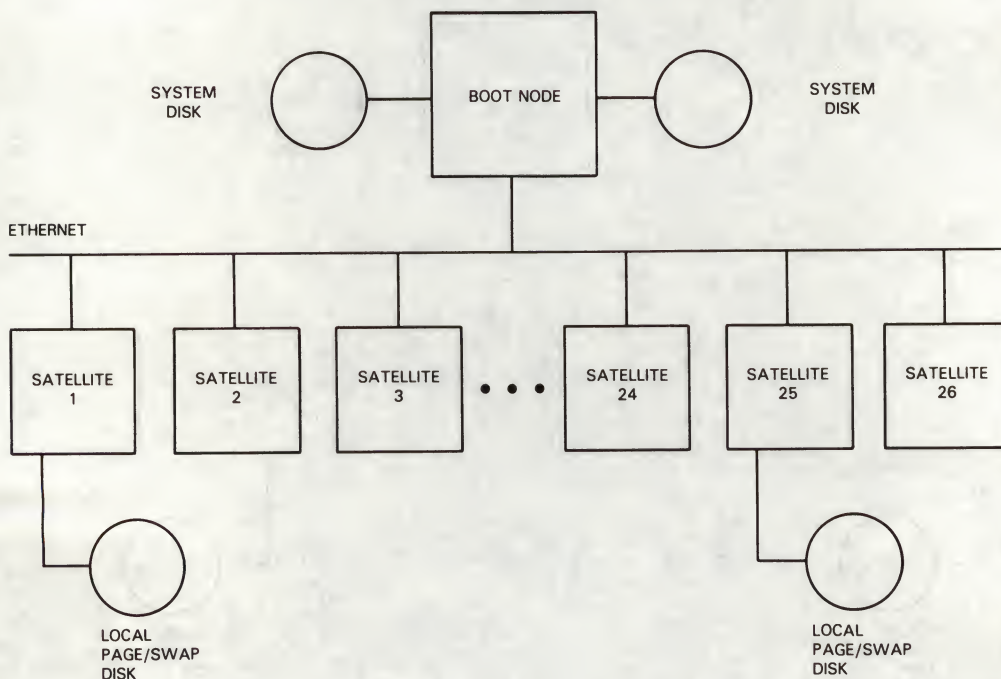
Figures 1-1, 1-2, and 1-3 illustrate typical Local Area VAXcluster configurations. Note that the setup procedures described in Sections 2.1 through 2.4 and in Chapter 3 are required for *all* configurations. Section 2.5 describes procedures for setting up configurations like those shown in Figures 1-2 and 1-3.

Figure 1-1 Local Area VAXcluster Configuration with One Boot Node and One System Disk



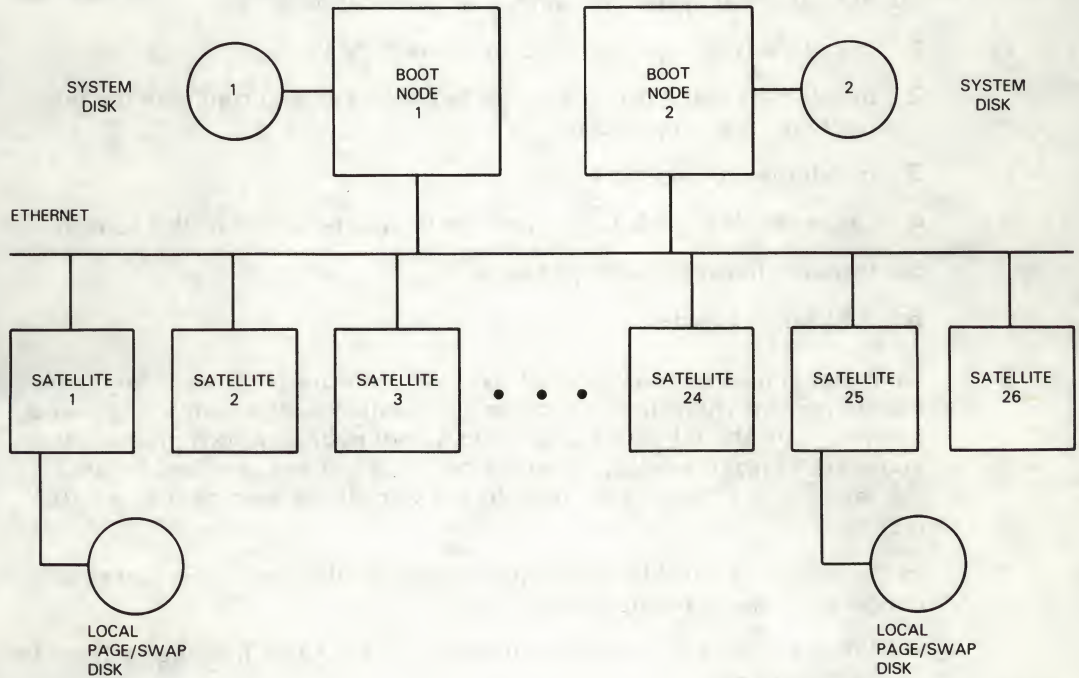
ZK-6164-HC

Figure 1-2 Local Area VAXcluster Configuration with One Boot Node and Two System Disks



ZK-6165-HC

Figure 1-3 Local Area VAXcluster Configuration with Two Boot Nodes and Two System Disks



ZK-6166-HC

1.3 Planning Cluster Setup Operations

The normal sequence of cluster setup operations is as follows. With a single exception (booting a newly added satellite node at its console terminal), you can execute these operations entirely on the boot node.

- 1 Install the VMS operating system or upgrade kit.
- 2 Install the Local Area VAXcluster Software key and configure the boot node for cluster operation.
- 3 Install the DECnet-VAX key.
- 4 Tailor the DECnet-VAX network for the cluster and start the network.
- 5 Install optional software products.
- 6 Add satellite nodes.

Note that you can install optional (layered) software products at any time, following instructions in the appropriate installation documents. If possible, however, you should plan to install on a boot node any such products that you want to make available clusterwide *before you add satellites*, because the satellites will then have access to the software as soon as they join the cluster.

In the case of MicroVMS Workstation Software, this strategy is particularly effective for the following reasons:

- When you add workstation satellites, AUTOGEN will configure them for optimal operation.
- Workstation software will be started automatically when the workstation satellites become active in the cluster.

Chapters 2 and 3 discuss installation and management procedures that apply specifically to the Local Area VAXcluster environment. To perform routine system and network management tasks, you can, for the most part, follow procedures described in the *VAX/VMS System Manager's Reference Manual*, the *VMS Local Area VAXcluster Manual*, and the *VAX/VMS Networking Manual*. Note, however, that references in those documents to the Computer Interconnect (CI) and Hierarchical Storage Controller (HSC) devices do not apply for Local Area VAXcluster configurations.

2

Installation, Security, and Network Tailoring

This chapter discusses the operations required to set up a Local Area VAXcluster configuration:

- Installing and upgrading the operating system
- Installing the Local Area VAXcluster Software key
- Configuring a boot node for cluster operation and securing the cluster
- Installing the DECnet-VAX key, tailoring the network for the cluster, and starting the network

When you have completed these operations, you can add satellite nodes using the `SATELLITE_CONFIG.COM` command procedure described in Chapter 3.

This chapter also provides instructions for configuring an extended cluster, using the following methods:

- Adding another system disk to an existing boot node
- Adding another boot node to an existing cluster
- Setting up a new cluster with two boot nodes

For information on these operations, refer to Section 2.5. Note that the setup operations described in Sections 2.1 through 2.4 are required for *all* Local Area VAXcluster configurations.

2.1 Installing and Upgrading the Operating System

To perform a *new installation* on VAX boot nodes, follow instructions in the installation booklets for your processor. To perform a *new installation* on MicroVAX II or VAXstation II boot nodes, refer to Appendix A.

To *upgrade* the VMS operating system on VAX boot nodes, follow instructions in the *VMS Version 4.6 Release Notes*. To *upgrade* the VMS or MicroVMS operating system on MicroVAX II or VAXstation II boot nodes, refer to Appendix B.

Caution

You must answer Y (or YES) when the installation or upgrade procedure asks if you want to generate a cluster common system disk.

If you are upgrading an existing Version 4.5A or 4.5C Local Area VAXcluster configuration to Version 4.6, refer to Sections C.1 and C.10.1 before starting the upgrade.

Note that references in the installation and upgrade procedures to the Computer Interconnect (CI) and to HSC-based system disks do not apply for Local Area VAXcluster configurations.

2.2 Installing the Local Area VAXcluster Software Key and Configuring the Boot Node for Cluster Operation

To install the Local Area VAXcluster Software key and configure the boot node for cluster operation, follow these steps:

- 1 Locate the Local Area VAXcluster Software medium.
- 2 Log in as system manager on the cluster boot node.
- 3 Mount the medium in an appropriate drive and put it on line.
- 4 Invoke the command procedure SYS\$UPDATE:VMSINSTAL.COM to install the key, specifying as parameters LAV010 and the name of the device holding the medium. (To determine the appropriate device name, see the third column in Table A-2.) For example:

```
$ @SYS$UPDATE:VMSINSTAL LAV010 ddcu:
```

When the installation is finished, VMSINSTAL displays a completion message and returns control to DCL command level.

- 5 Execute the command procedure SYS\$MANAGER:BOOT_CONFIG.COM. When the procedure asks whether you want to configure a boot node or add another system disk, select the CONFIGURE function. (For information on adding another system disk, see Section 2.5.)

The procedure then asks you to enter the following information:

- The *cluster group number*. The group number uniquely identifies each Local Area VAXcluster configuration on a single Ethernet. This number must be in the range from 1 to 4095 or 61440 to 65535.¹ Thus, if you plan to have more than one such cluster on a common

¹ If, during a previous Local Area VAXcluster installation, you have specified a group number outside the legal range, you must run the Cluster_Authorize Utility to specify a new group number and then reboot the entire cluster. (See Section 2.3.1.)

Ethernet at your site, be sure to specify a different group number for each.

- The *cluster password*. The password controls access to the cluster. It must be from 1 to 31 alphanumeric characters in length and may include dollar signs and underscores.
- The node's *SCSSYSTEMID value*. If you have performed a new installation of the VMS operating system, enter the value that you specified during that installation.
- The node's *DECnet node name*. If you have performed a new installation of the VMS operating system, enter the name that you specified during that installation.
- The *number of boot nodes* there will be in the cluster. If you plan to have only one boot node, enter 1. (For information on configuring another boot node, see Section 2.5.)

Note that both group number and password are requirements of the security functions discussed in Section 2.3.

When you have entered the information for which `BOOT_CONFIG.COM` prompts, the procedure will run `AUTOGEN` to reboot the system with cluster software running.

Example 2-1 shows a typical interactive `BOOT_CONFIG.COM` session for boot node `JOHNY`.

Example 2-1 Sample Interactive BOOT_CONFIG.COM CONFIGURE Session

\$ @BOOT_CONFIG.COM

Boot Node Configuration Procedure

This procedure can CONFIGURE a Local Area VAXcluster boot node or ADD another system disk.

CONFIGURE a boot node or ADD another system disk [CONFIGURE]? RET

This procedure configures a boot node in a cluster. It initializes the cluster authorization file, sets the volume label of SYS\$SYSDEVICE to JOHNY_SYS, modifies SYS\$SYSTEM:MODPARAMS.DAT, invokes AUTOGEN, and reboots the system with the new parameters.

To ensure that you have the required privileges, invoke this procedure from the system manager's account.

WARNING - The cluster PASSWORD will not be echoed.

Enter this cluster's group number: 1011

Enter this cluster's password:

Reenter the password for verification:

Enter this node's SCSSYSTEMID value: 2249

Enter this node's DECnet node name: JOHNY

How many boot nodes will be in this cluster (1 or 2)? 1

AUTOGEN computes the SYSGEN parameters for your configuration and then reboots the system with the new parameters.

After the reboot, you may want to configure other nodes in your cluster.

%SET-I-INTSET, login interactive limit=64, current interactive value = 0
SYSTEM job terminated at 15-JUN-1987 09:30:33.21

2.3 Securing the Cluster

Because multiple clusters may coexist on a single Ethernet, mechanisms are provided to ensure the integrity of individual clusters and to prevent access to a cluster (accidental or deliberate) by an unauthorized node.

Cluster security mechanisms prevent problems that could otherwise occur under circumstances like the following:

- When setting up a new cluster, the cluster manager specifies a group number identical to that of an existing cluster on the same Ethernet. (This condition is not as unlikely as it may at first appear, because cluster managers will probably not assign group numbers randomly.) However, provided each cluster's password is unique, the new cluster will form independently.
- A satellite node user with access to a local system disk tries to join a cluster by executing a conversational SYSBOOT operation at the satellite's console.

The following mechanisms are designed to help cluster managers perform security functions:

- A cluster authorization file (SYS\$COMMON: <SYSEXE> CLUSTER_AUTHORIZE.DAT), initialized during execution of BOOT_CONFIG.COM, and maintained with the Cluster_Authorize Utility
- Control of conversational bootstrap operations on satellite nodes

These mechanisms are discussed in Sections 2.3.1 and 2.3.2.

2.3.1 Maintaining Cluster Security Data

Security data is maintained in the cluster authorization file, SYS\$COMMON: <SYSEXE> CLUSTER_AUTHORIZE.DAT, which contains the cluster group number and (in encrypted form) the cluster password. The file is accessible only to users with the SYSPRV privilege.

Under normal conditions, you will not need to alter records in the CLUSTER_AUTHORIZE.DAT file interactively. However, if you suspect a security breach, for example, you may want to change the cluster password. In that case, you use the Cluster_Authorize Utility to make the change.

Note that if your configuration has two system disks, each disk will have a copy of CLUSTER_AUTHORIZE.DAT. You must run the utility twice to update both copies (see Section 2.5.3).

Caution

If you change either the group number or password, you must reboot the entire cluster.

To invoke the Cluster_Authorize Utility, log in as system manager on the boot node and enter the following command:

```
$ RUN SYS$SYSTEM:CLUSTER_AUTHORIZE
```

When the utility responds with the CAF> prompt, you can enter any of the commands listed in Table 2-1.

Table 2-1 Summary of Cluster_Authorize Utility Commands

| Command | Parameters/Qualifiers | Function |
|---------|------------------------------------|---|
| EXIT | None | Terminates the utility and returns control to DCL command level. |
| HELP | [command-name] [qualifier-name] | Lists and explains utility commands and qualifiers. |
| SET | | Updates a record in the cluster authorization file, SYS\$COMMON: <SYSEXE> CLUSTER_AUTHORIZE.DAT. (The SET command will create this file if it does not already exist.) Prompts for cluster group number and password if they are not specified. If you press RETURN in response to a prompt, the current value will not be changed. |
| | /[NO]GROUP_NUMBER | Group number must be in the range from 1 to 4095 or 61440 to 65535. Specify /NOGROUP_NUMBER if the group number is not to be changed. |
| | /[NO]PASSWORD | Password may be from 1 to 31 characters in length and may include alphanumeric characters, dollar signs, and underscores. Specify /NOPASSWORD if the current password is not to be changed. |
| SHOW | None | Displays the cluster group number. |

Example 2-2 illustrates the use of the Cluster_Authorize Utility to change the cluster password on boot node JOHNY.

Example 2-2 Sample Interactive Cluster_Authorize Session

```
$ RUN SYS$SYSTEM:CLUSTER_AUTHORIZE
CAF> SET/PASSWORD='newpassword'
Enter cluster group number [1011]: RET
%CAF-I-GRPNOCHG, Group number not changed
The cluster authorization file has been updated.
The entire cluster should be rebooted.
CAF> EXIT
$
```

2.3.2 Controlling Conversational Bootstrap Operations

When you add a satellite node to the cluster using SATELLITE_CONFIG.COM, the procedure asks whether you want to allow conversational bootstrap operations for the satellite (default is NO). If you press RETURN, SYSGEN parameter PE3 in the satellite's SYSGEN parameter file remains set to 0 to disable such operations. The parameter file, VAXVMSSYS.PAR, resides in the satellite's root directory on a boot node's system disk ('device': <SYSx.SYSEX>). You may later enable conversational bootstrap operations for a given satellite at any time by setting this parameter to 1.

For example, to enable such operations for a satellite booted from root B on device JOHNY\$DUA0, you would proceed as follows:

- 1 Log in as system manager on the boot node.
- 2 Invoke the System Generation Utility (SYSGEN) and enter the commands shown:

```
$ RUN SYS$SYSTEM:SYSGEN
SYSGEN> USE JOHNY$DUA0:<SYSB.SYSEX>VAXVMSSYS.PAR
SYSGEN> SET PE3 1
SYSGEN> WRITE JOHNY$DUA0:<SYSB.SYSEX>VAXVMSSYS.PAR
SYSGEN> EXIT
$
```

2.4 Installing the DECnet-VAX Key, and Tailoring and Starting the Network

After you have configured the boot node for cluster operation, you must install the DECnet-VAX key to activate full function DECnet-VAX capability on your VMS operating system. Before proceeding, note the following:

- The cluster boot node requires a DECnet-VAX full function license.
- Each satellite requires either a DECnet-VAX end node license or a DECnet-VAX full function license.

To install the DECnet-VAX key on VAX boot nodes, follow instructions in the *DECnet-VAX Key Installation Guide* distributed with the DECnet-VAX media kit. For MicroVAX II or VAXstation II boot nodes, follow instructions in the DECnet-VAX media kit cover letter.

When the key is installed, you perform the following operations to tailor the network for the cluster, and then you start the network. (For more detailed information on these operations, refer to the *VAX/VMS Networking Manual*.)

- Configure the network on the cluster boot node, using the command procedure `SYS$MANAGER:NETCONFIG.COM`.
- Enable service for the DECnet Ethernet adapter circuit that the boot node will use to service satellite nodes. When you execute `NETCONFIG.COM` in step 2, you will see a command that defines the circuit available on your system—for example, `QNA-0` or `UNA-0`. Specify that circuit in step 3.
- Define, in the boot node's executor database, a maximum address value that is large enough to accommodate future growth.
- Optionally define an alias node identifier for the cluster. The cluster alias acts as a single node identifier that all participating cluster nodes can use to communicate with other nodes in the network. You establish an alias node identifier using NCP commands like those shown in step 3 for alias `LAZRUS`. (For more information on alias node identifiers, refer to the *VAX/VMS Networking Manual*.) Note that if you plan to define an alias node identifier, you must specify that the cluster boot node operate as a *router* node when you execute `NETCONFIG.COM`. Note further that you must later enable alias operations for satellite nodes, as described in Section 3.6.
- Make remote node data available clusterwide.

To perform these tailoring operations and start the network, proceed as follows:

- 1 Log in as system manager on the boot node.

- 2 Execute the command procedure NETCONFIG.COM, entering information about your boot (executor) node when prompted, and responding YES when the procedure asks whether you want to configure the network ("want to go ahead and do it").

Caution

When the procedure asks if you want the network started, be sure to answer *NO*, because you must first perform several additional tailoring operations.

Example 2-3 shows typical responses for a cluster network configuration session using NETCONFIG.COM.

Example 2-3 Sample Interactive Network Configuration Session

\$ @NETCONFIG.COM

DECnet-VAX network configuration procedure

This procedure will help you define the parameters needed to get DECnet running on this machine. You will be shown the changes before they are executed, in case you want to perform them manually.

What do you want your DECnet node name to be? [JOHNY]:
What do you want your DECnet address to be? [2.201]:
Do you want to operate as a router? [NO (nonrouting)]:
Do you want a default DECnet account? [YES]:

Here are the commands necessary to set up your system.

.
.
.
\$ RUN SYS\$SYSTEM:NCP
 DEFINE LINE QNA-0 STATE ON
 DEFINE CIRCUIT QNA-0 STATE ON COST 4
.
.
.

Do you want to go ahead and do it? [YES]:

(If the license is already installed) Do you want DECnet started? [YES] NO
\$

- 3 Invoke the Network Control Program (NCP) Utility to enable circuit service, define a maximum address value for the boot node, and (optionally) define an alias node identifier for the cluster. For example:

```
$ RUN SYS$SYSTEM:NCP
NCP> DEFINE CIRCUIT QNA-O SERVICE ENABLED
NCP> DEFINE EXECUTOR MAXIMUM ADDRESS 1023
NCP> DEFINE NODE 2.1 NAME LAZRUS
NCP> DEFINE EXECUTOR ALIAS NODE LAZRUS
NCP> EXIT
$
```

The information you specify using these commands is entered in the boot node's DECnet-VAX permanent executor database and takes effect when you start the network.

- 4 NETCONFIG.COM creates (in the boot node's SYS\$SPECIFIC: <SYSEXE> directory) the file NETNODE_REMOTE.DAT, in which remote node data is maintained. To make this data available clusterwide, you must rename the file to the boot node's SYS\$COMMON: <SYSEXE> directory:

```
$ RENAME SYS$SPECIFIC:<SYSEXE>NETNODE_REMOTE.DAT -
_$ SYS$COMMON:<SYSEXE>NETNODE_REMOTE.DAT
```

Some sites with large networks maintain remote node data in a central database file. If this is the case at your site, and if you want to make the data available in your cluster, you can, *after starting the network*, copy remote node database entries from that central file. For example, if the file resides on node KATHY, you could enter the following NCP commands to copy entries from the permanent database on KATHY to the permanent database on your boot node, and then to update your volatile database:

```
NCP> COPY KNOWN NODES FROM KATHY USING PERMANENT TO PERMANENT
NCP> SET KNOWN NODES ALL
```

Note that only node names and addresses are copied. See the *VAX/VMS Networking Manual* for more information on copying node databases.

- 5 Start the network:

```
$ @STARTNET.COM
```

- 6 To ensure that the network is started each time the system boots, add the following line to your site-specific startup command file (SYS\$MANAGER:SYSTARTUP.COM):

```
$ @SYS$MANAGER:STARTNET.COM
```

For more detailed information on DECnet-VAX configuration issues and procedures, refer to the *VAX/VMS Networking Manual*.

2.5 Configuring an Extended Cluster

Because a Local Area VAXcluster system disk supports a maximum of 13 satellites, you must use a second system disk if your cluster is to include more than this number of satellites. Depending on your current configuration and available resources, you can configure an extended cluster in one of the following ways:

- If your boot node is a VAX 8500 machine or larger, you can set up a second system disk on the machine, as described in Section 2.5.4.
- If your boot node is a VAX machine smaller than a VAX 8500, or if it is a MicroVAX II or VAXstation II machine, you must configure a second boot node in the cluster and use that node's system disk as the second system disk. (See Sections 2.5.6 and 2.5.7.)

CAUTION

In a dual boot node configuration, the SYSGEN parameter QUORUM is always set to 2 on *both* boot nodes. Should one of these nodes fail, cluster operations will be suspended until the node rejoins the cluster. This condition is normal, and ensures the integrity of shared cluster resources.

The next sections describe procedures that you can use to set up each of these configurations.

2.5.1 Coordinating Cluster Common Files

To prepare a common user environment for a Local Area VAXcluster configuration with two system disks, you must coordinate these system files:

- SYSUAF.DAT
- NETUAF.DAT
- RIGHTSLIST.DAT
- VMSMAIL.DAT
- NETNODE_REMOTE.DAT
- JBCSYSQUE.DAT

The method you use to coordinate the files will vary, depending on whether both system disks are to be configured on the same boot node, or whether there is to be one system disk on each of two boot nodes.

If both system disks are to be configured on the same boot node, proceed as follows **before** adding the new disk.

- 1 At the start of the file <V4COMMON.SYSMGR> SYSTARTUP.COM, include logical name definitions that point to the location of the cluster common files. For example, if the files are to be located on JOHNY\$DUA0, you could define logical names like the following:

```
$ DEFINE/SYSTEM/EXEC SYSUAF -  
    JOHNY$DUA0:<V4COMMON.SYSEXE>SYSUAF.DAT  
$ DEFINE/SYSTEM/EXEC NETUAF -  
    JOHNY$DUA0:<V4COMMON.SYSEXE>NETUAF.DAT  
$ DEFINE/SYSTEM/EXEC RIGHTSLLIST -  
    JOHNY$DUA0:<V4COMMON.SYSEXE>RIGHTSLLIST.DAT  
$ DEFINE/SYSTEM/EXEC VMSMAIL -  
    JOHNY$DUA0:<V4COMMON.SYSEXE>VMSMAIL.DAT  
$ DEFINE/SYSTEM/EXEC NETNODE_REMOTE -  
    JOHNY$DUA0:<V4COMMON.SYSEXE>NETNODE_REMOTE.DAT
```

These logical names must be defined *before* you add satellites. If you plan to add satellites before the next system reboot, you can define the names interactively.

- 2 To ensure that both system disks are correctly mounted with each reboot, follow these steps:
 - a. Copy the file SYS\$EXAMPLES:CLU_MOUNT_DISK.COM to the directory <V4COMMON.SYSMGR> .
 - b. In the file <V4COMMON.SYSMGR> SYSTARTUP.COM, immediately following the logical name definitions, include commands to mount the two system disks with appropriate volume labels. For example, if the system disks are JOHNY\$DUA0 and JOHNY\$DUA1, you would include commands like these:

```
$ @SYS$SYSDEVICE:<V4COMMON.SYSMGR>CLU_MOUNT_DISK.COM -  
    JOHNY$DUA0: volume-label  
$ @SYS$SYSDEVICE:<V4COMMON.SYSMGR>CLU_MOUNT_DISK.COM -  
    JOHNY$DUA1: volume-label
```

- 3 In the site-specific file used for queue setup, specify the location of the job controller queue file (JBCSYSQUE.DAT), using a command like the following:

```
$ START/QUEUE/MANAGER JOHNY$DUA0:<V4COMMON.SYSEXE>JBCSYSQUE.DAT
```


If the second system disk is to be located on a second boot node, proceed as follows:

- 1 After bringing up the second boot node, determine which node's system disk will contain the cluster common files.
- 2 Repeat the steps listed above on both nodes.

2.5.2 Starting the DECnet-VAX Network and MicroVMS Workstation Software in a Configuration with Two System Disks

When a boot node in a Local Area VAXcluster configuration with two system disks is rebooted, logical names for cluster common files must be defined, and both system disks must be mounted (as described in Section 2.5.1), *before* either the DECnet-VAX network or MicroVMS Workstation Software is started.

In the file `<V4COMMON.SYSMGR> SYSTARTUP.COM`, you must therefore include commands that define the logical names and mount the system disks *before* commands that start the DECnet-VAX network and workstation software.

Caution

During an initial installation of MicroVMS Workstation Software, the installation procedure inserts a command to start the software at the beginning of SYSTARTUP.COM. Thus, if you plan to install workstation software for the first time after setting up a Local Area VAXcluster configuration with two system disks, you must, after the workstation software installation completes, edit the file `<V4COMMON.SYSMGR> SYSTARTUP.COM` and move the workstation startup command to a position *after* the logical name definitions and mount commands described in Section 2.5.1. If your configuration has two boot nodes, you must edit the file on *both* boot nodes.

2.5.3 Updating the Cluster Authorization File in a Configuration with Two System Disks

A Local Area VAXcluster configuration with two system disks requires two copies of the cluster authorization file, `CLUSTER_AUTHORIZE.DAT`—one for each system disk. If you want to alter either the cluster group number or password in such a configuration, you must run the Cluster_Authorize Utility twice to update both copies.

If you have one system disk on each of two boot nodes, log in as system manager on each boot node in turn and run the utility as described in Section 2.3.1.

If both system disks are located on the same boot node, first log in as system manager on the boot node and run the utility to update CLUSTER_AUTHORIZE.DAT on the original system disk. Then log in as system manager on a satellite booted from the second system disk and run the utility again to update CLUSTER_AUTHORIZE.DAT on the second system disk.

2.5.4 Setting Up a Second System Disk on a Cluster Boot Node

To set up a second system disk on a cluster boot node,¹ proceed as follows, *after* you have coordinated cluster common files, as described in Section 2.5.1.

- 1 Log in as system manager on the boot node, if you have not already done so.
- 2 Place a blank disk in an appropriate drive and spin up the disk.
- 3 Invoke the command procedure SYS\$MANAGER:BOOT_CONFIG.COM and select the ADD function. The procedure will prompt you for the name of the new system disk. It will then back up the original system disk to the new one, delete from the new disk any duplicated system roots, and mount the disk clusterwide. Note that you will see VAX RMS error messages while the procedure deletes directory files. You can ignore these messages.

Example 2-4 shows a typical interactive BOOT_CONFIG.COM ADD session on boot node JOHNY.

¹ Dual system disks are supported only on VAX 8500 or larger boot nodes.

Example 2-4 Sample Interactive BOOT_CONFIG.COM ADD Session

\$ @BOOT_CONFIG.COM

Boot Node Configuration Procedure

This procedure can CONFIGURE a Local Area VAXcluster boot node or ADD another system disk.

CONFIGURE a boot node or ADD another system disk [CONFIGURE]? **ADD**

The ADD command creates another system disk by:

- o backing up the current system disk to the new system disk.
- o removing from the new system disk any system roots that are duplicated on the current system disk.

WARNING - Do not proceed unless you have defined appropriate logical names for cluster common files in your site-specific startup procedures. See the documentation for instructions.

Do you want to continue [NO]? **YES**

What is the device name for the new system disk? **DUA1:**

%DCL-I-ALLOC, _JOHNY\$DUA1: allocated

%MOUNT-I-MOUNTED, SCRATCH mounted on _JOHNY\$DUA1:

Backing up the current system disk to the new system disk...

%MOUNT-I-MOUNTED, JOHNY_SYS mounted on _JOHNY\$DUA1:

Deleting all duplicated roots...

Deleting directory tree SYS0...

%DELETE-I-FILDEL, DUA1:<SYS0>DECNET.DIR;1 deleted (2 blocks)

%DELETE-I-FILDEL, DUA1:<SYS0>SYSCBI.DIR;1 deleted (2 blocks)

System root SYS0 deleted.

Deleting directory tree SYS1...

Example 2-4 Cont'd. on next page

Example 2-4 (Cont.) Sample Interactive BOOT_CONFIG.COM ADD Session

```
%DELETE-I-FILDEL, DUA1:<SYS1>DECNET.DIR;1 deleted (2 blocks)
%DELETE-I-FILDEL, DUA1:<SYS1>SYSCBI.DIR;1 deleted (2 blocks)
```

```
.
.
System root SYS1 deleted.
```

```
.
.
All the roots have been deleted.
```

```
What is the unique label for the new system disk [JOHNY_SYS2]? RET
```

```
%MOUNT-I-MOUNTED, JOHNY_SYS2 mounted on _JOHNY$DUA1:
```

The second system disk has been created. Satellites can now be added.

2.5.5 Installing New Layered Products on a Boot Node with a Second System Disk

Any layered products that were installed on your original system disk when you set up a second system disk will be accessible to satellite nodes that boot from the new system disk.

You must, however, install on *both* system disks any *new or updated* layered products that you want to make available clusterwide. The quickest way to perform such installations is as follows:

- 1 Log in as system manager on the boot node.
- 2 Mount the layered product distribution medium in an appropriate drive and put in on line.
- 3 Install the layered product following instructions in the installation document for the product.

Use the GET (G) option of the VMSINSTAL.COM command procedure to place the product save sets in a disk directory. For example, if you are installing a product named CALENDAR from a VAX-11/785 console drive into the disk directory WORK: <NEWPRODUCTS> , you would first enter the following command:

```
$ @SYS$UPDATE:VMSINSTAL CALENDAR CSA1: OPTIONS G WORK:<NEWPRODUCTS>
```


To install the product from that directory, you would then enter this command:

```
$ @SYS$UPDATE:VMSINSTAL CALENDAR WORK:<NEWPRODUCTS>
```

- 4 After the installation on the first system disk has completed, log in as system manager *locally* on a satellite node that is booted from the second system disk.
- 5 Enter the same command that you used to install the product from the directory on the original system disk:

```
$ @SYS$UPDATE:VMSINSTAL CALENDAR WORK:<NEWPRODUCTS>
```

The layered product will be installed on the second system disk, and it will be accessible to satellite nodes that boot from that disk.

2.5.6 Configuring a Second Boot Node in an Existing Cluster

To configure a second boot node in an existing cluster, perform steps 1 through 3 and 5 through 7 on that node; perform step 4 on the original boot node.

- 1 Install the VMS operating system, as described in Section 2.1.
- 2 Install the Local Area VAXcluster Software key as described in Section 2.2.
- 3 Execute the command procedure SYS\$MANAGER:BOOT_CONFIG.COM, and select the CONFIGURE function.

Caution

When you execute this procedure, you must specify the same group number and password that you used for the original boot node. When the procedure asks how many boot nodes will be in the cluster, you must enter 2 to set the correct value (2) for the SYSGEN parameter QUORUM.

- 4 Reexecute the procedure on the original boot node and specify 2 when the procedure asks how many boot nodes will be in the cluster. (Be sure *not* to change either the cluster group number or password.)
- 5 Install the DECnet-VAX key, and tailor and start the network, as described in Section 2.4.
- 6 Coordinate cluster common files, as described in Section 2.5.1.
- 7 Install any layered products that must be available clusterwide.

2.5.7 Setting Up a New Cluster with Two Boot Nodes

To set up a new cluster with two boot nodes, you must perform steps 1 through 3 on **both** boot nodes, and then perform steps 4 through 6 on each in turn. Note that the first boot node will wait until quorum is reached (that is, until the second node comes up) before it continues booting and joins the cluster.

- 1 Install the VMS operating system, as described in Section 2.1.
- 2 Install the Local Area VAXcluster Software key, as described in Section 2.2.
- 3 Execute the command procedure `SYSS$MANAGER:BOOT_CONFIG.COM` and select the `CONFIGURE` function.

Caution

You must specify the same group number and password for both boot nodes. When the procedure asks how many boot nodes will be in the cluster, you must enter 2 to set the correct value (2) for the `SYSGEN` parameter `QUORUM`.

- 4 Install the DECnet-VAX key and tailor and start the network, as described in Section 2.4.
- 5 Coordinate cluster common files, as described in Section 2.5.1.
- 6 Install any layered products that must be available clusterwide. Note that you must install any *new or updated* layered products on both boot nodes.

3

Configuring Satellite Nodes in the Cluster

This chapter explains how to configure satellite nodes using the SATELLITE_CONFIG.COM command procedure in the boot node's SYS\$MANAGER directory. That procedure, by prompting for certain information (listed in Table 3-2), allows you to configure satellites easily and reliably, *without invoking VMS utilities directly*. You use SATELLITE_CONFIG.COM to perform the following functions:

- Add a satellite node to the cluster.
- Remove a satellite node from the cluster.
- Modify a MicroVAX II or VAXstation II satellite node's Ethernet hardware address in the boot node's network database.

Table 3-1 describes the system and network management operations that these functions automate and shows the information for which each function prompts.

Note that you can remove a satellite node or modify its Ethernet hardware address relatively quickly, working exclusively on the cluster boot node. But because the ADD function executes many system and network management operations, you should allow about twenty minutes to add a satellite. And you (or another responsible person) will be required to boot the satellite at its console terminal.

Table 3-1 Operations Automated by SATELLITE_CONFIG.COM

| Function | Automated Operations |
|----------|--|
| ADD | Establish a satellite node's root directory on a boot node's cluster common system disk. Directory name has the form 'device': <SYSx> . <i>Procedure prompts for device and root directory names, supplies valid defaults.</i> |
| | Configure the network database to enable remote booting of the satellite. <i>Procedure prompts for network information.</i> |
| | Generate, in the directory 'device': <SYSx.SYSEXE> , system parameter files for the satellite (VAXVMSSYS.PAR, MODPARAMS.DAT); if local paging and swapping requested, generate SATELLITE_PAGE.COM. |
| | Generate an initial (temporary) startup procedure for the satellite. This procedure configures the network, runs AUTOGEN to set appropriate SYSGEN parameter values for the satellite, and reboots the satellite with normal startup procedures. |
| | Generate the satellite's page and swap files (PAGEFILE.SYS and SWAPFILE.SYS), either on a boot node's system disk or on the satellite's local disk. <i>Procedure prompts for location and sizes of these files.</i> |
| REMOVE | Delete the satellite's root directory and its contents from the boot node's system disk. <i>Procedure prompts for device and root directory names.</i> |
| | Configure the network database to disable remote booting of the satellite node. <i>Procedure prompts for network information.</i> |
| MODIFY | Modify MicroVAX II or VAXstation II satellite's Ethernet hardware address in a boot node's network database. <i>Procedure prompts for DECnet node name and new Ethernet hardware address.</i> |

The following sections explain how you prepare for and execute configuration functions using SATELLITE_CONFIG.COM.

3.1 Preparing to Execute SATELLITE_CONFIG.COM

Before you execute the procedure, be sure to verify the following:

- You are logged in to the system manager's account on the boot node with these process privileges: SYSPRV, OPER, CMKRNL, BYPASS, NETMBX. The privileges are required, because the procedure performs sensitive system operations.
- The DECnet-VAX network is up and running, and service is enabled for the Ethernet adapter circuit that the boot node will use to connect to satellites. (See Section 2.4.)
- You have at hand the satellite node data listed in Table 3-2.
- *If your configuration has two system disks, you have coordinated cluster common files, as described in Section 2.5.1.*

Sections 3.2, 3.3, and 3.4 provide examples of typical interactive configuration sessions.

Caution

You may not initiate concurrent SATELLITE_CONFIG.COM sessions.

Table 3-2 Data Required by SATELLITE_CONFIG.COM

| Item | How To Specify Or Obtain |
|--|--|
| Device name of cluster system disk on which satellite root directories will be created | Cluster manager specifies. Default is SYS\$SYSDEVICE. |
| Satellite's root directory name on cluster system disk | Cluster manager specifies. Must be of the form SYSx, where x is a hexadecimal digit in the range 1 through 9 or A through D (for example, SYS1 or SYSA). Procedure supplies valid default. |
| Satellite's DECnet node name | Network manager supplies. Name must begin with alpha character. |
| Satellite's DECnet node address | Network manager supplies. |

Table 3–2 (Cont.) Data Required by SATELLITE_CONFIG.COM

| Item | How To Specify Or Obtain |
|---|---|
| Satellite's Ethernet hardware address | <p>When Local Area VAXcluster software and DECnet-VAX network are running on boot node, follow these steps:</p> <p>1 For MicroVAX II and VAXstation II satellites, enter the following command at satellite's console-mode prompt:</p> <pre>>>> B/100 XQ</pre> <p>For MicroVAX 2000 and VAXstation 2000 satellites, enter the following commands at successive console-mode prompts:¹</p> <pre>>>> T 53 2 ?>>> 3 >>> B/100 ES</pre> <p>2 Enter READ_ADDR at Bootfile: prompt.</p> |
| Location and sizes of satellite's page and swap files | <p>Cluster manager specifies. (If page and swap files are located on satellite's local disk, subsequent reboots of satellite will generate an error message. Message can be ignored.)</p> |

¹If the second prompt appears as 3 ?> > > , press RETURN.

3.1.1 Setting Up Page and Swap Files

When you add a satellite node to the cluster using SATELLITE_CONFIG.COM, the procedure prompts for the sizes and location of the satellite's page and swap files. (The default sizes supplied by the procedure are minimums.) Note that, depending on the configuration of your system disk and your network, you may realize a performance improvement by locating page and swap files on a satellite's local RD series disk, if such a disk is available. If you decide to use a local disk, you should specify a page file size of 20,000 blocks or more, and a swap file size of 12,000 blocks or more.

Configuring Satellite Nodes in the Cluster

To set up page and swap files on a satellite's local disk, SATELLITE_CONFIG.COM creates (in the satellite's <SYSx.SYSEX> directory on the boot node's system disk) the command procedure SATELLITE_PAGE.COM. This procedure executes when AUTOGEN reboots the satellite at the end of SATELLITE_CONFIG.COM, and it performs the following functions:

- Mounts the satellite's local disk and sets its volume label to a name in the format 'node'_SCSSYSTEMID.
- Installs the page and swap files on the local disk.

To alter the volume label, follow these steps after the satellite has been added to the cluster:

- 1 Enter a DCL command in the following format:

```
$ SET VOLUME/LABEL=volume-label device-spec[:]
```

Note that the SET VOLUME command requires write access (W) to the index file on the volume. If you are not the volume's owner, you must have either a system UIC or the SYSPRV privilege.

- 2 Update SATELLITE_PAGE.COM to reflect the new label.

To relocate the satellite's page and swap files—for example, from the satellite's local disk to the boot node's system disk, or the reverse—the easiest way is to remove the satellite from the cluster and then read it, using SATELLITE_CONFIG.COM.

3.1.2 Maintaining Network Configuration Data

When you execute SATELLITE_CONFIG.COM for the first time, the procedure creates the file NETNODE_UPDATE.COM in the boot node's SYS\$SPECIFIC: <SYSMGR> directory. This file, which is updated each time you add, remove, or modify satellite nodes, contains all essential network configuration data for the satellite. If an unexpected condition at your site should cause configuration data to be lost, you can use NETNODE_UPDATE.COM to restore it. You can also read the file when you need to obtain data about individual satellites.

Example 3-1 shows the contents of the file after nodes LINDA and CHERYL have been added to the cluster.

Example 3-1 Sample NETNODE_UPDATE.COM File

```
$ run sys$system:ncp
  define node LINDA address 2.55
  define node LINDA hardware address 08-00-2B-03-51-75
  define node LINDA load assist agent sys$share:niscs_laa.exe
  define node LINDA load assist parameter SYS$SYSDEVICE:<SYSA.>
  define node LINDA service circuit QNA-0
  define node CHERYL address 2.56
  define node CHERYL hardware address 08-00-2B-03-58-14
  define node CHERYL load assist agent sys$share:niscs_laa.exe
  define node CHERYL load assist parameter SYS$SYSDEVICE:<SYSB.>
  define node CHERYL service circuit QNA-0
```

3.2 Adding a Satellite Node to the Cluster

Adding a satellite node to the cluster is the only configuration function that you cannot perform entirely on the boot node, because the satellite must be booted locally. You will probably want to arrange for the satellite's intended user (or another responsible person) to stand by at the satellite's console terminal. Before proceeding, be sure you have all the information listed in Table 3-2.

If your boot node has two system disks, be sure to specify the appropriate device when the procedure prompts for the device name of the satellite's system root.

Note that because all nodes in a Local Area VAXcluster configuration must have the same DECnet area number, you must, when specifying the satellite's DECnet address, use the same area number that you used for the cluster boot node.

While adding satellites, you may want to disable broadcast messages to your terminal. (The ADD function generates many such messages.) To disable the messages, you can enter the DCL command SET TERMINAL /NOBROADCAST.

Example 3-2 illustrates the use of SATELLITE_CONFIG.COM to add satellite node LINDA to the cluster.

Caution

If for some reason either the boot node or the satellite should fail before the ADD function completes, you must, after normal conditions are restored, perform the REMOVE function to erase any invalid data, and then restart the ADD function.

Example 3-2 Sample Interactive SATELLITE_CONFIG.COM ADD Session

\$ @SATELLITE_CONFIG.COM

Satellite Configuration Procedure

This procedure configures a satellite node in the cluster. It can ADD or REMOVE a satellite node, and it can MODIFY the network database.

To ensure that you have the required privileges, invoke this procedure from the system manager's account.

If the local disk on the satellite node is to be INITIALIZED for paging and swapping, please be sure you are satisfied with the BACKUP of the local disk before proceeding.

```
ADD, REMOVE or MODIFY a satellite node [ADD]? RET
Verifying circuits in network database...
What is the device name for the new system root [SYS$SYSDEVICE:]? RET
What is the name of the new system root [SYSA]? RET
What is the DECnet node name of the satellite node? LINDA
What is the DECnet node address of the satellite node? 2.55
Allow conversational bootstraps on the satellite node [NO]? RET
Creating directory tree SYSA...
%CREATE-I-CREATED, SYS$SYSDEVICE:<SYSA> created
%CREATE-I-CREATED, SYS$SYSDEVICE:<SYSA.SYSEXE> created
%CREATE-I-CREATED, SYS$SYSDEVICE:<SYSA.SYSLIB> created
%SET-I-ENTERED, SYS$SYSDEVICE:<SYSO.><000000>SYSCOMMON.DIR;1 entered as
SYS$SYSDEVICE:<SYSA>SYSCOMMON.DIR;
%CREATE-I-CREATED, SYS$SYSDEVICE:<SYSA.SYSTEST> created
%CREATE-I-CREATED, SYS$SYSDEVICE:<SYSA.SYSMAINT> created
%CREATE-I-CREATED, SYS$SYSDEVICE:<SYSA.SYSMGR> created
%CREATE-I-CREATED, SYS$SYSDEVICE:<SYSA.SYSHLP> created
%CREATE-I-CREATED, SYS$SYSDEVICE:<SYSA.SYSHLP.EXAMPLES> created
%CREATE-I-CREATED, SYS$SYSDEVICE:<SYSA.SYSUPD> created
%CREATE-I-CREATED, SYS$SYSDEVICE:<SYSA.SYSMSG> created
%CREATE-I-CREATED, SYS$SYSDEVICE:<SYSA.SYSERR> created
%CREATE-I-CREATED, SYS$SYSDEVICE:<SYSA.SYSCBI> created
System root SYSA created.
What is the hardware address of the satellite node? 08-00-2B-03-51-75
Updating network database...
Size of pagefile for the new satellite [10000 blocks]? 20000
Size of swap file for the new satellite [8000 blocks]? 12000
May this procedure use a local disk on the satellite for paging and swapping? YES
Creating temporary page file in order to boot LINDA for the first time...
%SYSGEN-I-CREATED, SYS$SYSDEVICE:<SYSA.SYSEXE>PAGEFILE.SYS;1 created
```

Example 3-2 Cont'd. on next page

Example 3-2 (Cont.) Sample Interactive SATELLITE_CONFIG.COM ADD Session

This procedure will now wait until the satellite node is a member of this cluster.

Once the satellite node joins the cluster, this procedure will ask you which local disk it can use for paging and swapping.

Please boot the satellite node now.

Waiting for satellite node to boot...

Waiting for satellite node to boot...

(User enters boot command at satellite's console-mode prompt (>>>)).
For MicroVAX II and VAXstation II satellites, user enters B XQ.
For MicroVAX 2000 and VAXstation 2000 satellites, user enters B ES.)

The local disks on LINDA are:

| Device Name | Device Status | Error Count | Volume Label | Free Blocks | Trans Count | Mnt Cnt |
|--------------|---------------|-------------|--------------|-------------|-------------|---------|
| LINDA\$DUA0: | Online | 0 | | | | |
| LINDA\$DUA1: | Online | 0 | | | | |

Which disk can be used for paging and swapping? LINDA\$DUA0:

May this procedure INITIALIZE LINDA\$DUA0: [YES]? NO

%MOUNT-I-MOUNTED, LINDA_2103 mounted on _LINDA\$DUA0:

PAGEFILE.SYS already exists on LINDA\$DUA0:

Directory LINDA\$DUA0: [SYSO.SYSEXE]

PAGEFILE.SYS;1 23000/23000

Total of 1 file, 23000/23000 blocks.

What is the file specification for the page file on

LINDA\$DUA0: [<SYSO.SYSEXE>PAGEFILE.SYS]? RET

%CREATE-I-EXISTS, LINDA\$DUA0:<SYSO.SYSEXE> already exists

This procedure will use the existing pagefile,

LINDA\$DUA0:<SYSO.SYSEXE>PAGEFILE.SYS;.

Example 3-2 Cont'd. on next page

Example 3-2 (Cont.) Sample Interactive SATELLITE_CONFIG.COM ADD Session

%MOUNT-I-MOUNTED, LINDA_2103 mounted on _LINDA\$DUA0:

SWAPFILE.SYS already exists on LINDA\$DUA0:

Directory LINDA\$DUA0: [SYSO.SYSEXE]

SWAPFILE.SYS;1 12000/12000

Total of 1 file, 12000/12000 blocks.

What is the file specification for the swap file on

LINDA\$DUA0: [<SYSO.SYSEXE>SWAPFILE.SYS]? RET

This procedure will use the existing swapfile,

LINDA\$DUA0:<SYSO.SYSEXE>SWAPFILE.SYS;.

Waiting for AUTOGEN to reboot satellite...

Waiting for AUTOGEN to reboot satellite...

.
.
.

The satellite configuration procedure has successfully completed.

3.3 Removing a Satellite Node from the Cluster

The REMOVE function is a relatively quick operation that can be performed entirely on the boot node. Note, however, that *you must shut down the satellite before removing it*. If possible, use the command procedure SYS\$SYSTEM:SHUTDOWN.COM to perform an orderly shutdown. Otherwise, press and release the satellite's HALT button.

If your boot node has two system disks, be sure to specify the appropriate device when the procedure prompts for the device name of the satellite's system root.

Example 3-3 illustrates the use of SATELLITE_CONFIG.COM to remove satellite node LINDA from the cluster.

Note

Because the REMOVE function deletes the satellite's entire root directory tree, it generates VAX RMS error messages while deleting directory files. You can ignore these messages.

Configuring Satellite Nodes in the Cluster

Example 3-3 Sample Interactive SATELLITE_CONFIG.COM REMOVE Session

\$ @SATELLITE_CONFIG.COM

Satellite Configuration Procedure

This procedure configures a satellite node in the cluster. It can ADD or REMOVE a satellite node, and it can MODIFY the network database.

To ensure that you have the required privileges, invoke this procedure from the system manager's account.

If the local disk on the satellite node is to be INITIALIZED for paging and swapping, please be sure you are satisfied with the BACKUP of the local disk before proceeding.

ADD, REMOVE or MODIFY a satellite node [ADD]? REMOVE

The REMOVE command disables a satellite node by:

- o deleting its root directory tree.
- o removing its remote booting information from the network database.

What is the device name for the system root [SYS\$SYSDEVICE:]? RET

What is the name of the system root? SYSA

What is the DECnet node name of the satellite node? LINDA

Verifying network database...

Deleting directory tree SYSA...

%DELETE-I-FILDEL, SYS\$SYSDEVICE:<SYSA>SYSCBI.DIR;1 deleted (1 block)

%DELETE-I-FILDEL, SYS\$SYSDEVICE:<SYSA>SYSERR.DIR;1 deleted (1 block)

%DELETE-W-FILNOTDEL, error deleting SYS\$SYSDEVICE:<SYSA>SYSEXE.DIR;1

-RMS-E-MKD, ACP could not mark file for deletion

-SYSTEM-F-DIRNOTEMPTY, directory file is not empty

%DELETE-W-FILNOTDEL, error deleting SYS\$SYSDEVICE:<SYSA>SYSHLP.DIR;1

-RMS-E-MKD, ACP could not mark file for deletion

-SYSTEM-F-DIRNOTEMPTY, directory file is not empty

%DELETE-I-FILDEL, SYS\$SYSDEVICE:<SYSA>SYSLIB.DIR;1 deleted (1 block)

%DELETE-I-FILDEL, SYS\$SYSDEVICE:<SYSA>SYSMINT.DIR;1 deleted (1 block)

%DELETE-W-FILNOTDEL, error deleting SYS\$SYSDEVICE:<SYSA>SYSMGR.DIR;1

-RMS-E-MKD, ACP could not mark file for deletion

-SYSTEM-F-DIRNOTEMPTY, directory file is not empty

Example 3-3 Cont'd. on next page

Example 3-3 (Cont.) Sample Interactive SATELLITE_CONFIG.COM REMOVE Session

```
%DELETE-I-FILDEL, SYS$SYSDEVICE:<SYSA>SYMSG.DIR;1 deleted (1 block)
%DELETE-I-FILDEL, SYS$SYSDEVICE:<SYSA>SYSTEST.DIR;1 deleted (1 block)
%DELETE-I-FILDEL, SYS$SYSDEVICE:<SYSA>SYSUPD.DIR;1 deleted (1 block)
%DELETE-I-FILDEL, SYS$SYSDEVICE:<SYSA.SYSEXE>MODPARAMS.DAT;1 deleted (1 block)
%DELETE-I-FILDEL, SYS$SYSDEVICE:<SYSA.SYSEXE>PAGEFILE.SYS;1 deleted (4608 blocks)
%DELETE-I-FILDEL, SYS$SYSDEVICE:<SYSA.SYSEXE>STARTUP1.COM;1 deleted (5 blocks)
%DELETE-I-FILDEL, SYS$SYSDEVICE:<SYSA.SYSEXE>VAXVMSSYS.PAR;2 deleted (15 blocks)
%DELETE-I-FILDEL, SYS$SYSDEVICE:<SYSA.SYSEXE>VAXVMSSYS.PAR;1 deleted (15 blocks)
%DELETE-I-FILDEL, SYS$SYSDEVICE:<SYSA.SYSEXE>VMSPARAMS.DAT;1 deleted (36 blocks)
%DELETE-I-FILDEL, SYS$SYSDEVICE:<SYSA.SYSHLP>EXAMPLES.DIR;1 deleted (1 block)
%DELETE-I-FILDEL, SYS$SYSDEVICE:<SYSA.SYSMGR>VMSIMAGES.DAT;1 deleted (6 blocks)
%DELETE-I-TOTAL, 15 files deleted (4694 blocks)
%DELETE-I-FILDEL, SYS$SYSDEVICE:<SYSA>SYSEXE.DIR;1 deleted (1 block)
%DELETE-I-FILDEL, SYS$SYSDEVICE:<SYSA>SYSHLP.DIR;1 deleted (1 block)
%DELETE-I-FILDEL, SYS$SYSDEVICE:<SYSA>SYSMGR.DIR;1 deleted (1 block)
%DELETE-I-TOTAL, 3 files deleted (3 blocks)
%DELETE-I-FILDEL, SYS$SYSDEVICE:<000,000>SYSA.DIR;1 deleted (1 block)
System root SYSA deleted.
Updating network database...
The satellite configuration procedure has successfully completed.
```

3.4 Modifying a MicroVAX II or VAXstation II Satellite Node's Ethernet Hardware Address

You perform the MODIFY function when you want to specify a new Ethernet hardware address for a MicroVAX II or VAXstation II satellite, should its Ethernet device need replacement.

Example 3-4 illustrates the use of SATELLITE_CONFIG.COM to specify a new hardware address for satellite node LINDA.

Example 3-4 Sample Interactive SATELLITE_CONFIG.COM MODIFY Session

\$ @SATELLITE_CONFIG.COM

Satellite Configuration Procedure

This procedure configures a satellite node in the cluster.
It can ADD or REMOVE a satellite node, and it can MODIFY
the network database.

To ensure that you have the required privileges, invoke this
procedure from the system manager's account.

If the local disk on the satellite node is to be INITIALIZED for
paging and swapping, please be sure you are satisfied with the
BACKUP of the local disk before proceeding.

ADD, REMOVE or MODIFY a satellite node [ADD]? **MODIFY**
What is the DECnet node name of the satellite node? **LINDA**
What is the new hardware address [08-00-2B-03-51-75]? **08-00-3B-05-37-78**
Updating network database...
The satellite configuration procedure has successfully completed.

3.5 Controlling Clusterwide Broadcast Messages

When a satellite node joins the cluster, broadcasts for all message classes
are initially enabled for the satellite by default. Satellite node users can
disable such broadcasts selectively by including a form of the DCL command
SET BROADCAST in their LOGIN.COM files. For example, the following
command would disable OPCOM and SHUTDOWN messages:

```
$ SET BROADCAST=(NOOPCOM, NOSHUTDOWN)
```

Note that broadcasts to the operator console terminal (OPA0:) on
workstation nodes are disabled by default and should remain disabled
at all times. Users who want to receive broadcast messages can create a
terminal window, and then enter the DCL command REPLY/ENABLE.
(This command requires OPER privilege.) For more detailed information
on workstation operations, refer to the documentation supplied with the
workstation software.

In large clusters, state transitions (nodes joining or leaving the cluster) will
generate many multiline OPCOM messages on the boot node's console
device. Cluster managers can abbreviate such messages by including the
DCL command REPLY/DISABLE=CLUSTER in the appropriate site-specific
startup command file, or by entering the command interactively from the
system manager's account on the boot node.

3.6 Enabling Cluster Alias Operations

If you have defined an alias node identifier for your cluster as described in Section 2.4, you can enable alias operations for satellites after the satellites have joined the cluster. To enable such operations (that is, to allow a satellite to accept incoming connect requests directed toward the cluster alias node identifier), follow these steps:

- 1 Log in on the satellite node *locally* as system manager.
- 2 Invoke the Network Control Program (NCP) Utility and enter these commands:

```
NCP> SET EXECUTOR STATE OFF
NCP> DEFINE EXECUTOR ALIAS INCOMING ENABLED
NCP> EXIT
$
```

- 3 Start the network on the satellite node:

```
$ @SYS$MANAGER:STARTNET.COM
```

3.7 Setting Up MSCP-Served Local Disks

To conserve nonpaged pool, the MSCP Server is not loaded on satellite nodes, and their local disks are not served to the cluster. (On the boot node, the MSCP Server is always loaded.) If you want to serve a satellite's local disks (for example, if the disks contain data that must be available to other cluster nodes), proceed as follows:

- 1 Log in on the satellite node *locally* as system manager.
- 2 Edit the file SYS\$SYSTEM:MODPARAMS.DAT and add the following line:

```
MSCP_LOAD = 1
```

A value of 1 for the AUTOGEN symbol MSCP_LOAD specifies that the MSCP Server is to be loaded and local disks served when the node reboots.

- 3 Verify that the volume label of each local disk is unique in the cluster. If it is not, you can use the DCL command SET VOLUME/LABEL to specify a new label. For example:

```
$ SET VOLUME/LABEL=volume-label device-spec[:]
```

- 4 Invoke the AUTOGEN.COM command procedure with the GETDATA, REBOOT, and INITIAL parameters:

```
$ @SYS$UPDATE:AUTOGEN GETDATA REBOOT INITIAL
```

Note that when the system reboots, the MSCP Server will be loaded with a set of default values that is adequate for most situations. (For information on these values, and for instructions on modifying them, see Section C.9.)

If you wish to disable service for local disks, you must set the value of the AUTOGEN symbol MSCP_LOAD to 0 and then invoke AUTOGEN to reboot the satellite.

Caution

Do not attempt to serve disks by loading the MSCP Server with the System Generation Utility (SYSGEN) and then using DCL SET DEVICE/SERVED commands. This procedure could disrupt normal cluster operations.

4

Guidelines for Satellite Node Users

This chapter explains procedures that users of satellite nodes may follow to

- Join and leave the cluster.
- Perform operations that affect other users.
- Identify and report problems.

These procedures are discussed in the next sections.

4.1 Joining and Leaving the Cluster

To include a satellite node in the cluster, the cluster manager (or another responsible individual) executes a command procedure (SYS\$MANAGER:SATELLITE_CONFIG.COM) that requires the satellite node to be booted at its console terminal. Depending on site policy, this individual may contact the satellite node's intended user to arrange a mutually convenient time for the boot operation.

Occasionally, it may be necessary to remove one or more satellite nodes from the cluster, usually to perform various update, maintenance, or trouble-shooting operations. At these times, the cluster manager (or another responsible individual) may contact satellite node users to make arrangements.

4.2 Performing Operations that Affect Other Users

Satellite node users have access to clusterwide resources for file sharing, data storage, and batch processing. In addition, they can use the satellite's processor to perform editing, program development, and other interactive tasks locally.

These users should be aware, however, that they can, by performing certain operations, affect other cluster members and the normal functioning of the entire cluster. They must, therefore, consult the cluster manager (or another responsible individual) before they perform either of the following operations:

- Halt, power down, or reboot a satellite node. Note that *under normal conditions, a satellite node should be active (powered up) at all times.*

Guidelines for Satellite Node Users

- Modify any files in the SYS\$COMMON directory (if the user is privileged).

By showing consideration for other users, individuals who share cluster resources can help ensure the continuing trouble-free operation of the entire cluster.

4.3 Identifying and Reporting Problems

Occasionally, users may notice a brief slowdown of interactive response time. This condition may occur when a satellite node joins or leaves the cluster. Users should be aware that the condition is usually temporary.

If, however, a user's node fails to respond to command input for protracted periods (longer than a few minutes), or if a user repeatedly obtains unexpected results from operations that worked in the past, that user should proceed as follows:

- Report to the cluster manager (or another responsible individual) *immediately* any protracted interruption of interactive response.
- For instances of unexpected system responses, try to reproduce such responses several times. If the problem persists, make a record of the following items:
 - The operation being attempted when the problem occurred
 - User input and the system's response
 - The conditions under which the problem occurred
- Provide the cluster manager (or another responsible individual) with a detailed problem report, including, if possible, an example of both user input and the system's response.

For effective problem analysis, timely notification and accurate information are crucial.

A

Installing the Operating System on MicroVAX II or VAXstation II Boot Nodes

This appendix describes the procedure for installing the VMS operating system on MicroVAX II or VAXstation II boot nodes.

WARNING

The software installation procedure overwrites the entire contents of the system disk. If your system disk contains files that you want to save, be sure to back up the disk before proceeding.

Before you install the system software, your hardware must be installed and checked for proper operation.

Obtain the DECnet area number and node number for your processor from either your network or cluster manager before starting the installation. You will need this information to complete the installation procedure.

Here are definitions for some terms that may not be familiar to you.

Table A-1 Installation Procedure Terms

| Term | Definition |
|--------------------------|--|
| load-device | The drive that holds the distribution medium during the installation. You must specify the physical device name when you are prompted for the <i>load-device</i> . |
| system-device | The drive that holds the system disk you are building. You must specify the physical device name when you are prompted for the <i>system-device</i> . |
| console-mode device name | The name of the <i>load-device</i> or <i>system-device</i> you specify for commands entered at the console-mode prompt (> > >). |
| VMS device name | The name of the <i>load-device</i> or <i>system-device</i> you specify for commands entered at the DCL prompt (\$). |
| spin up/spin down | To spin up means to bring a disk drive up to operating speed; to spin down means to bring it to a gradual stop. |
| boot | Literally "bootstrap load"; the process of software loading itself into a computer. |

Installing the Operating System on MicroVAX II or VAXstation II Boot Nodes

Be sure you have all the items listed on the distribution kit bill of materials. If your kit is incomplete, notify the DIGITAL Software Distribution Center and request priority shipment of any missing components.

This procedure assumes that the system is powered up when you start the installation.

- 1 Decide which drive will hold the distribution medium and which drive will hold the system disk.
- 2 Turn on the console terminal, if you have not already done so.
- 3 Place the distribution medium in the load-device, write protect it, and put it on line.
- 4 If you are building a removable system disk, place a blank disk in the system-device.
- 5 Spin up the system disk but do *not* write protect it.
- 6 When the console-mode prompt (> > >) appears, boot standalone BACKUP from the distribution medium on the load-device, using a command in the following format. See the second column in Table A-2 to determine the console-mode name for your load-device.

>>> B load-device

Table A-2 Determining Names for Load-Device and System-Device

| Device Type | Console-Mode Device Name ¹ | VMS Device Name ¹ |
|------------------|---------------------------------------|------------------------------|
| RA60 | DUcu | DJcu |
| RA80, RA81, RD54 | DUcu | DUcu |
| TK50, TU81 | MUcu | MUcu |

¹Variable **c** designates the device controller, and variable **u** is the device unit number.

- 7 When the standalone system finishes booting, it announces itself and asks for the date and time:

VAX/VMS Version 'version-number' DD-MMM-YYYY HH:MM

PLEASE ENTER DATE AND TIME (DD-MMM-YYYY HH:MM)

- 8 Enter the date in day-month-year format, and the time in hours and minutes, using the 24-hour clock format. For example, if the time is 3:58 P.M. and the date is June 17, 1987, type

PLEASE ENTER DATE AND TIME (DD-MMM-YYYY HH:MM) 17-JUN-1987 15:58

- 9 When standalone BACKUP finishes booting, it identifies itself and displays the dollar sign (\$) prompt:

%BACKUP-I-IDENT, stand-alone BACKUP . . .
\$

- 10 Enter a command in the following format to restore the *required* save set. See the third column in Table A-2 to determine the VMS names of the load-device and system-device.

\$ BACKUP/VERIFY load-device:REQUIRED/SAVE system-device:

This BACKUP command builds a system disk that includes a DIGITAL-provided set of volume parameters, including a cluster factor (disk access scheme) of 1. Most volume parameters can be changed later with the SET VOLUME command. However, to change the cluster factor you must back up the system to a volume that has been previously initialized to the desired cluster factor. To save the volume's initial parameter values, use the /NOINITIALIZE qualifier when you back up the system.

- 11 Depending on the distribution medium, it takes between 10 and 30 minutes to restore the required files. The following message indicates the start of the verification pass:

%BACKUP-I-STARTVERIFY, starting verification pass

When the required files are restored, standalone BACKUP identifies itself and displays the dollar sign prompt (\$), indicating that the verification pass is finished.

- 12 Press and release the HALT button to put the system in console mode.

- 13 Boot the system disk, using a command in the following format. See the second column in Table A-2 to determine the console-mode device name for the system-device.

>>> B system-device

- 14 When the boot is complete, the system displays a message like the following:

VAX/VMS Version 'version-number' DD-MMM-YYYY HH:MM

Please enter the date and time (DD-MMM-YYYY HH:MM):

Installing the Operating System on MicroVAX II or VAXstation II Boot Nodes

- 15** Enter the date in day-month-year format, and the time in hours and minutes, using the 24-hour clock format. For example, if the time is 4:30 P.M. and the date is June 17, 1987, type

Please enter the date and time (DD-MMM-YYYY HH:MM): **17-JUN-1987 16:30**

- 16** The procedure asks you which drive holds the distribution medium. Enter the device name for the load-device. See the third column in Table A-2 to determine the VMS name of the load-device.

Enter drive holding distribution kit (DDCU): **load-device:**

- 17** The procedure next gives you the opportunity to build a cluster common system disk and asks if you want to know more about such disks.

- 18** When the procedure asks if you want a cluster common system disk, enter Y (or YES):

Do you want to generate a cluster common system disk [N]? **YES**

- 19** The next message prompts you for the first of two SYSGEN parameters:

In order to successfully boot the system, you must provide a nonzero value for the SYSGEN parameter SCSSYSTEMID and a nonblank value for the SYSGEN parameter SCSNODE. See the Guide to VAXclusters for information on setting up other SYSGEN parameters after the system is installed. Enter this node's SCSSYSTEMID value:

Enter a value equal to your system's DECnet-VAX node number in decimal plus 1024 times the DECnet-VAX area number.

For example, if your DECnet-VAX node number is 201 and your DECnet-VAX area number is 2, the value for SCSSYSTEMID is calculated as follows:

$$201 + (2 * 1024) = 2249$$

- 20** The procedure prompts you for the second parameter:

Enter this node's SCSNODE name:

Enter your system's DECnet-VAX node name.

- 21** The procedure restores the rest of the operating system and displays appropriate messages:

Restoring library save set.

%BACKUP-I-STARTVERIFY, starting verification pass

Restoring optional save set.

%BACKUP-I-STARTVERIFY, starting verification pass

- 22** At this point, the procedure creates a V4COMMON directory tree.

- 23** The procedure prompts you for new passwords for the SYSTEM, SYSTEST, and FIELD accounts. Passwords must be at least six characters in length.
- 24** When you change the passwords, the procedure creates your RIGHTS database and displays a message indicating that AUTOGEN will compute SYSGEN parameters for your configuration and reboot the system with those parameters. The procedure also lists tasks that you may want to perform after the upgrade completes.
- 25** The procedure then indicates the start of AUTOGEN with this message:
- Running AUTOGEN - Please wait.
- When AUTOGEN finishes, the system displays a sequence of messages that begins like this:
- The system is shutting down to allow the VAX/VMS system to boot with the generated site-specific parameters and installed images.
- 26** The system reboots automatically. When the following message appears, the reboot is complete, and the operating system is running.

```
%SET-I-INTSET, login interactive limit=64, current interactive value = 0
SYSTEM          job terminated at DD-MMM-YYYY HH:MM:SS.CC
```

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DIVISION OF THE PHYSICAL SCIENCES
DEPARTMENT OF CHEMISTRY

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TO THE DIRECTOR
FROM THE DEPARTMENT OF CHEMISTRY
RE: [illegible]

[illegible]

[illegible]

[illegible]

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B

Upgrading the Operating System on MicroVAX II or VAXstation II Boot Nodes

This appendix explains how to perform the following operations:

- Upgrade the VMS operating system to VMS Version 4.6 on existing MicroVAX II and VAXstation II boot nodes.
- Upgrade the MicroVMS operating system to VMS Version 4.6 on MicroVAX II and VAXstation II systems that will become boot nodes in a new Local Area VAXcluster configuration.

Note that the preparatory steps described in Section B.2 vary, depending on whether you are upgrading a VMS or a MicroVMS system. Once you have performed these steps, the upgrade procedure is the same for both VMS and MicroVMS systems.

B.1 System Upgrade Contingencies

Before you attempt to upgrade your system, you should be aware of the following contingencies:

- If you have changed the names of system directories in your current operating system or if you have deleted system files from them, the upgrade procedure may not work correctly. You must restore your operating system to a standard system before you can begin the upgrade.
- The upgrade procedure does *NOT* work across the network.
- Neither the system disk nor the distribution medium can be moved from one device to another during the upgrade procedure.
- The page, swap, dump, and authorization files are purged to one version each as part of the upgrade procedure.
- All files in the [SYSERR] directory are deleted.
- All operator and accounting logs are deleted. To save these files, move them to a user directory before starting the upgrade.

To complete the upgrade procedure, you need the VMS Version 4.6 distribution medium.

B.2 Preparing to Upgrade the Operating System

To ensure that the upgrade completes successfully, DIGITAL recommends that you back up the system disk. This operation accomplishes the following:

- Preserves the original system disk.
- Improves disk performance by making free space on the new system disk contiguous.

The following conditions must also be met:

- The system disk must contain a minimum of 27,000 free blocks. To confirm the free-block count of the system disk, enter the following DCL command:

```
$ SHOW DEVICES SYS$SYSDEVICE
```

- The system page file must contain at least 4604 blocks.

To confirm the number of blocks in the system page file, enter the following DCL command:

```
$ @SYS$UPDATE:SWAPFILES
```

The SWAPFILES.COM command procedure displays the current sizes of the page, swap, and dump files and prompts you to enter new values. Press RETURN to retain the current values. If the page file contains fewer than 4604 blocks, enter the value 4604 when the procedure displays this prompt:

Enter new size for paging file:

The procedure then displays the following prompt:

Enter new size for system dump file:

Enter new size for swapping file:

Press RETURN in response to both prompts.

- SYSGEN parameters must be set to the following values for VMS and MicroVMS systems, respectively, and the system must be rebooted.

| Parameter | Value for VMS | Value for MicroVMS |
|-------------|---------------|--------------------|
| ALLOCLASS | 0 | not applicable |
| SCSNODE | blank (" ") | blank (" ") |
| SCSSYSTEMID | unused value | not applicable |
| STARTUP_P1 | "MIN" | not applicable |
| VAXCLUSTER | 0 | not applicable |

You can check and reset the values of these parameters, as shown for SCSNODE in the following example.

```
$ RUN SYS$SYSTEM:SYSGEN
SYSGEN> USE CURRENT
SYSGEN> SHOW SCSNODE
```

| Parameter Name | Current | Default | Minimum | Maximum | Unit | Dynamic |
|----------------|----------|---------|---------|---------|-------|---------|
| SCSNODE | "JOHNY " | " " | " " | "ZZZZ" | Ascii | |

```
SYSGEN> SET SCSNODE ""
SYSGEN> WRITE CURRENT
SYSGEN> SHOW SCSNODE
```

| Parameter Name | Current | Default | Minimum | Maximum | Unit | Dynamic |
|----------------|---------|---------|---------|---------|-------|---------|
| SCSNODE | " " | " " | " " | "ZZZZ" | Ascii | |

```
SYSGEN> EXIT
```

After you have reset the SYSGEN parameters for your system, invoke the command procedure SYS\$SYSTEM:SHUTDOWN.COM to shut down and reboot the system. When the procedure asks if you want the system to be rebooted automatically, answer Y (or YES). Note that to enable the upgrade to continue automatically, you must set the restart switch on the processor control panel to automatic restart. (Refer to the hardware documentation for your processor.)

- When the system comes up, enter the following command to prevent users from logging in to the system during the upgrade:

```
$ SET LOGINS/INTERACTIVE=0
```

Suggestion

Consider having a second terminal logged in for doing support tasks during the upgrade.

- If you are upgrading an existing VMS system to Version 4.6, you must reconfigure all available devices. Follow these steps:

- 1 Invoke SYSGEN and enter the commands shown:

```
$ RUN SYS$SYSTEM:SYSGEN
SYSGEN> AUTOCONFIGURE ALL
SYSGEN> EXIT
```

- 2 Execute STARTUP CONFIGURE:

```
$ @SYS$SYSTEM:STARTUP CONFIGURE
```

- If you are upgrading a MicroVMS system to VMS Version 4.6, you must shut down the DECnet-VAX network and stop any active queues. Follow these steps:

- 1 Remain logged in under the system manager's account, SYSTEM.

- 2 Invoke the NCP Utility and enter the commands shown to shut down the network:

```
$ RUN SYS$SYSTEM:NCP
NCP> SET EXECUTOR STATE OFF
NCP> EXIT
```

- 3 Enter the following command at the DCL command prompt (\$) to stop active queues:

```
$ STOP/QUEUE/MANAGER
```

B.3 Performing the Upgrade

To perform the upgrade, follow these steps:

- 1 Insert the distribution medium in an appropriate drive, write protect it, and put it on line.
- 2 Invoke the VMSINSTAL command procedure by entering the following command:

```
$ @SYS$UPDATE:VMSINSTAL
```

When VMSINSTAL displays the following prompt, press RETURN:

Are you satisfied with the backup of your system disk [YES]?

- 3 VMSINSTAL then displays the following prompt:

* Where will the distribution volumes be mounted:

Enter the physical device name of the drive holding the distribution medium, using the format **ddcu**—DJcu for RA60; MUcu for TK50.

- 4 When VMSINSTAL displays the * Products: prompt, enter VMS046.

- 5 VMSINSTAL then displays the following message and prompt:

Please mount the first volume of the set on 'ddcu':
Are you ready?

If you have not already done so, place the distribution medium in an appropriate drive, write protect it, and put it on line. Type Y and press RETURN.

- 6 VMSINSTAL displays the following messages:

%MOUNT-I-MOUNTED, SYSTEM mounted on _ddcu:

The following products will be processed:

VMS V4.6

Beginning installation of VMS V4.6 at 14:27

%VMSINSTAL-I-RESTORE, Restoring product save set A...

Depending on the distribution medium, this step takes between 5 and 10 minutes.

- 7 VMSINSTAL displays a series of messages that describe cautions and requirements related to completing the upgrade. After the messages are displayed, the following prompt appears:

Do you want to continue? (Y/N):

- To interrupt the upgrade to comply with any of the conditions listed, type N and press RETURN. The procedure displays the following prompt:

Enter the products to be processed from the next distribution volume set.

* Products:

- To terminate the procedure and return to the DCL prompt (\$), press CTRL/Z. If you terminate the upgrade at this point, you must reinvoke VMSINSTAL when you are ready to resume the upgrade.
- To proceed with Phase 1 of the upgrade, type Y and press RETURN.

B.3.1 Upgrade Phase 1

The remainder of the upgrade consists of five phases. This section describes the first phase.

- 1 The procedure gives you the opportunity to build a cluster common system disk and asks if you want to know more about such disks. *When the procedure asks if you want a cluster common system disk, you must enter Y (or YES):*

Do you want to generate a cluster common system disk [N]? **YES**

- 2 The procedure prompts you for new passwords for the SYSTEM, SYSTEST, and FIELD accounts.
- 3 The procedure turns off disk quotas on the system disk. Ignore any error messages about disk quotas being disabled.
- 4 The procedure stops OPCOM and the error formatter (ERRFMT).
- 5 The procedure purges directories and removes installed images.
- 6 The procedure purges all accounting data files, operator logs, and the directory [SYSERR]; ignore any error messages about files not being purged.
- 7 The procedure deletes all JNL files in the root directory and in all of its subdirectories. Ignore any "file not found" error messages.
- 8 The procedure builds the directory tree [SYSF] and deletes all the old operating system files that will not be needed if the system needs to be rebooted during Phase 1 of the upgrade. This step takes approximately 20 minutes.
- 9 The upgrade procedure restores the Version 4.6 required save set.
- 10 The procedure purges the page, swap, dump, and authorization files and puts the most current versions in the new directory tree.
- 11 The procedure uses AUTOGEN to save your old SYSGEN parameters and sets up the system to continue with Phase 2.
- 12 The procedure displays messages stating that it is shutting down the system, that the system disk and distribution medium must not be moved during the upgrade, and that SYSGEN parameters must not be changed while the system reboots.

When the system shutdown has completed, halt the system by pressing the halt button on the processor control panel. Then, reboot the system by entering the following command at the console-mode prompt (**> > >**), where **ddcu** is the name of the system disk:

>>> B/F0000000 ddcu

- 13 The system prompts you to enter the date and time, and continues automatically with Phase 2.

Note

Should the system fail to reboot in Phases 2 through 4, halt the system and enter the following command at the console-mode prompt:

>>> B/F0000000 ddcu

B.3.2 Upgrade Phase 2

This section describes the second phase of the upgrade procedure.

- 1 The system displays the following messages:

VMS Version 4.6 25-JUN-1987 15:26
Continuing with VAX/VMS V4.6 Upgrade Procedure.

Upgrade Phase 2 25-JUN-1987 15:28

- 2 The upgrade procedure removes the remaining files from the old version of the operating system. (This step takes approximately 20 minutes.)
- 3 The procedure then restores to the system disk the library and optional save sets.

B.3.3 Upgrade Phase 3

This section describes the third phase of the upgrade procedure.

- 1 The following system message is displayed on your console device:

Continuing with VAX/VMS V4.6 Upgrade Procedure.

Upgrade Phase 3 25-JUN-1987 15:48

- 2 The upgrade procedure merges new versions of the VMS system files (for example, DCLTABLES, HELP, and LIBRARY FILES) with existing files. This step takes approximately 10 to 15 minutes.
- 3 The procedure removes the directory entries for page, swap, dump, and authorization files from the old directory tree.
- 4 The procedure deletes all the remaining accounting data files, operator logs, and all files in the [SYSERR] directory.

- 5 The upgrade procedure merges all the miscellaneous user files that exist in the old system directories into the new set of system directories, temporarily called [SYSF.SYS*]. The amount of time this takes depends on the number of user files. Ignore any "file not found" error messages.
- 6 The procedure deletes the system directory tree containing the old version of the system files.

B.3.4 Upgrade Phase 4

This section describes the fourth phase of the upgrade procedure.

- 1 The following system message is displayed on your console device:

Continuing with VAX/VMS V4.6 Upgrade Procedure.

Upgrade Phase 4 25-JUN-1987 16:00

- 2 The upgrade procedure corrects the back links for the system directories. This step requires only a few seconds, and the procedure displays a message when it has completed.

- 3 The procedure gives you instructions on how to reboot the system and then shuts down the system.

When the shutdown has completed, halt the system by pressing the halt button on the processor control panel. Then, reboot the system by entering the following command at the console-mode prompt (> > >), where **ddcu** is the name of the system disk:

>>> **B ddcu**

B.3.5 Upgrade Phase 5

This section describes the fifth phase of the upgrade procedure.

- 1 The system displays the following messages:

VMS Version 4.6 25-JUN-1987 16:30

Continuing with VAX/VMS V4.6 Upgrade Procedure.

Upgrade Phase 5 25-JUN-1987 16:32

- 2 The upgrade procedure deletes the temporary [SYSF] directory tree.
- 3 The procedure purges files that were used only during the upgrade procedure.
- 4 The procedure displays messages listing tasks that you may want to perform after the upgrade completes.

Upgrading the Operating System on MicroVAX II or VAXstation II Boot Nodes

- 5 The procedure autoconfigures all devices on the system.
- 6 The procedure runs AUTOGEN to determine the new SYSGEN parameters. (This step takes approximately 5 to 10 minutes.)
- 7 The system reboots automatically after AUTOGEN has finished running.
- 8 You may be prompted to enter the date and time. When a message like the following appears, the reboot is complete, and the operating system is running.

```
%SET-I-INTSET, login interactive limit=64, current interactive value = 0  
SYSTEM          job terminated at DD-MMM-YYYY HH:MM:SS.CC
```

Note

If you are upgrading from VMS Version 4.5A or 4.5C, you will see informational and warning messages like the following when AUTOGEN begins to reboot the system. Once you have installed the Local Area VAXcluster Software key, the messages will not reappear at subsequent reboots.

```
VAX/VMS Version 'version-number' DD-MMM-YYYY HH:MM
```

```
waiting to form or join VAXcluster
```

```
%STACONFIG-I-LOADSECDB, loading the Local Area VAXcluster security database
```

```
SYSGEN%W-NOMSG, Message number 00000910
```

```
PEDRIVER.EXE
```

```
%STACONFIG-W-WARNING, unable to locate PEDRIVER, STS = 00000908
```

If you are upgrading a MicroVMS system to VMS Version 4.6, you will see the MicroVMS banner when the system reboots at the end of the upgrade. At subsequent reboots, however, the system will display the VMS banner.

- 9 Install the mandatory update. The mandatory update is found on a separate distribution medium. To install the mandatory update, refer to the discussion of post-upgrade procedures in the *VMS Version 4.6 Release Notes*.
- 10 Install the Local Area VAXcluster Software key.
- 11 Install the DECnet-VAX key.
- 12 Install any other optional software products listed in the Layered Products Caution section of the *VMS Version 4.6 Release Notes*.

Upgrading the Operating System on MicroVAX II or VAXstation II Boot Nodes

Caution

Always back up the system disk after applying new system software with any software application procedure. It is essential to have a current backup copy of the system disk.

C

Release Notes

The following release notes apply for Version 1.2 of Local Area VAXcluster Software running on the VMS Version 4.6 operating system.

C.1 Updating SYS\$SYSTEM:MODPARAMS.DAT Files When Upgrading an Existing Local Area VAXcluster Configuration to Version 4.6

Before starting the upgrade procedure in Local Area VAXcluster configurations running VMS Version 4.5A or 4.5C, you must perform the following operations:

- 1 Edit the file SYS\$SYSTEM:MODPARAMS.DAT on the boot node and remove entries that specify values for the following SYSGEN parameters:

- LOCKDIRWT
- MVTIMEOUT
- PASTDGBUF
- RECNXINTERVAL¹
- SPTREQ

In Version 4.6, AUTOGEN sets appropriate new values for the parameters.

- 2 Edit the file [SYSx.SYSEXE]:MODPARAMS.DAT in the root directories for each satellite node and remove entries that specify values for any of these parameters.

After you have upgraded to Version 4.6 on the boot node, reboot each satellite with AUTOGEN, specifying the parameters GETDATA, REBOOT, INITIAL.

¹ If you have set the value for RECNXINTERVAL to 40 seconds because you want to boot GPX systems from an asynchronous terminal (VT100 or VT200 series), do not remove the entry for this parameter. For more information on this condition, refer to Section C.7.

C.2 Maintaining MODPARAMS.DAT Files

Each time you execute either `BOOT_CONFIG.COM` or `SATELLITE_CONFIG.COM`, `AUTOGEN` appends entries for several `SYSGEN` parameters to the file `SYS$SYSTEM:MODPARAMS.DAT` on the boot and satellite nodes, respectively. The appended entries override any earlier entries for those parameters in the files. While the appended entries do not affect normal system operations, you may want to remove the earlier entries to make the files more readable.

C.3 Observing Ethernet Configuration Restrictions

You must observe the following restrictions when configuring your Ethernet for a Local Area VAXcluster environment. Note that the term *station* designates both processors and terminal servers such as `DECserver`. For detailed information on Ethernet device characteristics, refer to the appropriate hardware manuals.

- No more than 1023 stations may be connected to a single Ethernet.
- No more than one Local Network Interconnect (DELNI) device may share a common Ethernet transceiver connection. For example, two DELNIs wired in series may not be connected to an Ethernet transceiver.
- No bridge that provides less than full 10-megabit Ethernet throughput may be connected between stations.
- No bridge (such as a satellite link) that introduces propagation delays may be used between stations.

C.4 Rebooting a Satellite Node with an Operating System on a Local Disk

In some circumstances, cluster software reboots satellite nodes automatically. Before booting a satellite node, the boot procedures check for the presence of an operating system on the node's local disk. If an operating system (for example, a MicroVMS system) is found, that system—*not the Local Area VAXcluster operating system*—will be booted.

If an operating system is installed on a satellite's local disk, one of the following measures should be taken before performing any operation that causes an automatic reboot—for example, executing `SYS$SYSTEM:SHUTDOWN.COM` with the `REBOOT` option, or using `SATELLITE_CONFIG.COM` to add that node to the cluster:

- Rename the directory file `ddcu: <000000> SYS0.DIR` on the local disk to `ddcu: <000000> SYSx.DIR` (where `SYSx` is a root other than `SYS0`,

SYSE, or SYSF). Then enter the DCL command SET FILE/REMOVE to remove the old directory entry for the boot image SYSBOOT.EXE:

```
$ RENAME DUAO:<000000>SYSO.DIR DUAO:<000000>SYS1.DIR
$ SET FILE/REMOVE DUAO:<SYSEXE>SYSBOOT.EXE
```

For subsequent reboots of the system from the local disk, enter a command in the format B/x0000000 at the console-mode prompt (> > >). For example:

```
>>> B/1000000
```

- Disable the local disk. To disable the local disk on MicroVAX II or VAXstation II machines, press the READY button so that the light is off. (This option is not available if the satellite's local disk is being used for paging and swapping.)

C.5 Defining the Logical Name MOM\$LOAD as a Search List after Installation of DECserver Terminal Server Software

The systemwide executive-mode logical name MOM\$LOAD is defined during installation of the Local Area VAXcluster Software kit. If you have defined this name on your system, be aware that your definition will be superseded.

However, because software for DECserver terminal servers also uses this logical name, you must redefine the name as a search list if you install DECserver software. After installing DECserver software, edit the appropriate site-specific startup file in the boot node's SYS\$COMMON: <SYSMGR> directory and alter as follows the command that defines the MOM\$LOAD logical name:

```
$ DEFINE/SYSTEM/EXECUTIVE_MODE MOM$LOAD -
  SYS$SYSROOT:<DECSERVER>,SYS$COMMON:<MOM$SYSTEM>
```

C.6 Respecifying Cluster Group Numbers

Local Area VAXcluster group numbers must be within the range from 1 to 4095 or 61440 to 65535. If, during a previous Local Area VAXcluster installation, you have specified a group number outside the legal range, you must run the Cluster_Authorize Utility to specify a new group number and then reboot the entire cluster. (See Section 2.3.1.)

C.7 Adjusting RECNXINTERVAL Parameter to Boot VAXstation II/GPX Systems from Console Terminal Port

If you want to boot a VAXstation II/GPX system from a standard asynchronous terminal (VT100, VT200 series) connected to the machine's console terminal port, you must first increase the value of the SYSGEN parameter RECNXINTERVAL to 40 seconds on each node in the cluster.

C.8 Loading the Mass Storage Control Protocol (MSCP) Server on Satellite Nodes

On satellite nodes, the MSCP Server is not loaded by default. For instructions on loading the server, refer to Section 3.7.

C.9 Using AUTOGEN to Modify Mass Storage Control Protocol (MSCP) Server Values

In Local Area VAXcluster configurations, the MSCP Server is always loaded with the following set of default qualifier values:

| MSCP Qualifier | Units | Boot Node Default Values | Satellite Node Default Values |
|-----------------------|-----------------|---------------------------------|--------------------------------------|
| BUFFER | bytes | 32768 (64 pages) | 8192 |
| MAXIMUM | bytes | 8192 (16 pages) | 8192 |
| MINIMUM | bytes | 4096 (8 pages) | 4096 |
| PACKETS | number per host | 4 | 4 |
| HOSTS | number | 15 | 15 |
| TIMEOUT | seconds | 100 | 100 |
| PRIORITY | number | 4 | 4 |

Performance testing has shown that these values are adequate for most situations. If for some reason you find it necessary to alter the default values, use the following AUTOGEN symbols to specify new values in the file SYS\$SYSTEM:MODPARAMS.DAT on the boot or satellite node. Then

invoke AUTOGEN with the GETDATA, REBOOT, and INITIAL parameters to reboot the node with the new values.

| AUTOGEN Symbol | Units |
|----------------|-----------------|
| MSCP_BUFFER | bytes |
| MSCP_MAXIMUM | bytes |
| MSCP_MINIMUM | bytes |
| MSCP_PACKETS | number per host |
| MSCP_HOSTS | number |
| MSCP_TIMEOUT | seconds |
| MSCP_PRIORITY | number |

For example, if you add the line MSCP_BUFFER=65536 to the file SYS\$SYSTEM:MODPARAMS.DAT on node CHERYL, 128 pages of nonpaged pool will be allocated for the MSCP buffer area when CHERYL reboots.

For more information on SYSGEN MSCP qualifier values, refer to the *VAX/VMS System Generation Utility Reference Manual*.

C.10 Error and Warning Messages To Be Ignored

In the Local Area VAXcluster environment, it is normal for certain routine operations to generate error or warning messages. These operations and associated messages are discussed in the following sections. Unless otherwise noted, you can ignore the messages.

C.10.1 Upgrading the Operating System on Existing Boot Nodes Running VMS Version 4.5A or 4.5C

When upgrading an existing Local Area VAXcluster boot node running VMS Version 4.5A or 4.5C, you will see informational and warning messages like the following when AUTOGEN begins to reboot the system. You can ignore the messages.

VAX/VMS Version 'version-number' DD-MMM-YYYY HH:MM

waiting to form or join VAXcluster

%STACONFIG-I-LOADSECDB, loading the Local Area VAXcluster security database

SYSGEN%W-NOMSG, Message number 00000910

PEDRIVER.EXE

%STACONFIG-W-WARNING, unable to locate PEDRIVER, STS = 00000908

When the upgrade is complete, you must reinstall the Local Area VAXcluster key, as described in Section 2.2. Once the key is installed, the messages will not reappear at subsequent reboots.

C.10.2 Booting a Satellite Node During SATELLITE_CONFIG.COM ADD Phase

When a satellite node boots during the procedure's ADD phase, another command procedure, SYS\$MANAGER:NETCONFIG.COM, executes. NETCONFIG.COM invokes the Authorize Utility, which, at that point, will generate the following error and informational messages:

%UAF-E-UAEERR, invalid username, username already exists

%UAF-I-NOMODS, no modifications made to system authorization file

%UAF-I-RDNOMODS, no modifications made to rights database

C.10.3 Shutting Down a Satellite Node During SATELLITE_CONFIG.COM ADD Phase

During its ADD phase, SATELLITE_CONFIG.COM invokes the AUTOGEN.COM command procedure with the parameters GETDATA REBOOT INITIAL. AUTOGEN then performs an orderly shutdown on the satellite node. During this initial shutdown procedure, you will see the following error message:

%SYSTEM-F-DEVOFFLINE, device is not in configuration or not available

C.10.4 Booting a Workstation Node before MicroVMS Workstation Software Is Installed

If you boot a workstation node before workstation software is installed, you will see SYSGEN warning and error messages like the following:

```
%SYSGEN-W-OPENIN, error opening SYS$COMMON:<SYSEXE>VCDRIVER.EXE; as input  
%SYSGEN-E-FNF, file not found.
```

After you install workstation software, the messages will not reappear at subsequent reboots.

C.10.5 Starting the DECnet-VAX Network on MicroVAX II Or VAXstation II Boot Nodes before Adding Satellites

After starting the network on a MicroVAX II or VAXstation II boot node, messages reporting various DECnet-VAX events (4.7, 4.10, 4.15, 0.7) will be displayed until you have added the first satellite. These messages are normal.

C.10.6 Breaking Port-To-Port Virtual Circuit Connections

Port-to-port virtual circuit connections, required for cluster internode communication, are maintained by the port emulator driver (PEDRIVER.EXE). When connections are broken, the driver displays one or more messages in the following format:

```
%PEA0, Software is Closing Virtual Circuit - REMOTE NODE 'nodename'
```

The 'nodename' will be that of the satellite node. (Note that the corresponding error log entry for the device PEA0: in the file SYS\$ERRORLOG:ERRLOG.SYS is "PACKET SIZE VIOLATION".)

The %PEA0 message will be displayed at the boot node's console device under the following circumstances, and with the frequency indicated:

- Whenever a satellite node boots (two to four times).
- Whenever a satellite node shuts down or crashes (one to three times).
- Whenever a cable or Ethernet adapter fails (at least once). *In this case, you must make arrangements to have the cable or adapter repaired or replaced.*

The message may also be displayed once at the satellite node's console terminal when the node boots. In that case, the 'nodename' will be that of the boot node.

C.10.7 Running the User Environment Test Package (UETP) Ethernet Test

The UETP Ethernet test (UETUNAS00) produces error messages like the following when run in the Local Area VAXcluster environment:

```
***** UETINIT01 ** Error count = 1 *****
-UETP-E-TEXT, Error running UETUNAS00.EXE for controller XQA - final status was:
-SYSTEM-F-BADPARAM, bad parameter value
%UETP-S-COPY_LOG, Copy of log from testing XQA follows:
%UETP-S-BEGIN, UETUNAS00 beginning at 15-JUN-1987 10:17:16.08
***** UNAS_XQA ** Error count = 1 *****
-UETP-E-ABORT, UNAS_XQA aborted at 15-JUN-1987 10:17:16.89
-SYSTEM-F-BADPARAM, bad parameter value
%UETP-F-ENDED, UETUNAS00 ended at 15-JUN-1987 10:17:16.91
```

The error messages occur because the Ethernet device has been allocated to the cluster itself.

Index

A

- Adding a satellite node • 3-6
- Adding a second system disk to a cluster boot node • 2-14
- Alias node identifier
 - See DECnet-VAX network
- Alias operations
 - See DECnet-VAX network
- Authorize Utility (AUTHORIZE)
 - expected messages when booting satellite node during SATELLITE__CONFIG.COM ADD phase • C-6
- AUTOGEN.COM command procedure
 - executed by BOOT_CONFIG.COM • 2-3
 - executed during SATELLITE__CONFIG.COM ADD phase • 3-2
 - setting SYSGEN parameters during upgrade procedure • B-9
 - using to modify MSCP Server values • C-4

B

- BOOT_CONFIG.COM command procedure
 - adding a second system disk to cluster boot node • 2-14
 - configuring boot node for cluster operation • 2-3
 - sample interactive ADD session • 2-14
 - sample interactive CONFIGURE session • 2-3
 - setting up cluster security database • 2-2
- Boot node
 - breaking port-to-port virtual circuit connections • C-7
 - configuring DECnet-VAX network • 2-8
 - configuring a second boot node in the cluster • 2-17
 - configuring for cluster operation • 2-3

Boot node (cont'd.)

- expected DECnet-VAX messages on MicroVAX II or VAXstation II systems before adding satellites • C-7
 - functions • 1-1
 - installing DECnet-VAX key • 2-8
 - installing layered products on a second system disk • 2-16
 - installing Local Area VAXcluster Software key • 2-2
 - installing VMS operating system • 2-1
 - legal systems • 1-1
 - restrictions for MicroVAX II and VAXstation II processors • 1-1
 - setting up a new cluster with two boot nodes • 2-18
 - setting up a second system disk • 2-14
 - setting up security database • 2-2
 - upgrading operating system • 2-1
 - upgrading VMS operating system on existing boot node • C-5
- ### Broadcast messages
- controlling • 3-12
 - disabling while adding satellites • 3-6
 - OPCOM messages • 3-12
 - shutdown messages • 3-12

C

- Cluster_Authorize Utility (CLUSTER_AUTHORIZE)
 - See Security functions
- Cluster authorization file (CLUSTER_AUTHORIZE.DAT)
 - See Security functions
- Cluster common files • 1-1
 - coordinating for two boot nodes • 2-11
 - coordinating for two system disks • 2-11
- Cluster group number • 2-2
 - respecifying within legal range • C-3
- Cluster password • 2-2

Index

Computer Interconnect (CI) device • 1-4,
2-2

Conversational bootstrap

See Security functions

D

DECnet-VAX network

alias node identifier, defining for cluster •
2-8

alias operations, enabling for satellite
nodes • 3-13

area number and node name
obtaining prior to installation of VMS
operating system • A-1

area number and node number
using to calculate value of
SCSSYSTEMID parameter • A-4

circuit service, enabling for cluster boot
node • 2-8

configuring on boot node using
NETCONFIG.COM command
procedure • 2-8

Ethernet hardware address, modifying for
satellite node • 3-11

expected messages when running on
MicroVAX II or VAXstation II boot
node before adding satellites • C-7

installing key • 2-8

license requirements • 2-8

maximum address value, defining for
cluster boot node • 2-8

NETCONFIG.COM command procedure,
sample interactive session • 2-9

NETNODE_REMOTE.DAT file, renaming
to SYS\$COMMON directory • 2-10

NETNODE_UPDATE.COM command
procedure, using to restore satellite
configuration data • 3-5

Network Control Program (NCP) • 2-10

remote node data, making available
clusterwide • 2-8

remote node database entries, copying •
2-10

DECnet-VAX network (cont'd.)

restoring satellite network configuration
data • 3-5

same area number required for all nodes •
3-6

starting the network • 2-10
in dual system disk configuration •
2-13

tailoring • 2-8

DECserver terminal server software

redefining MOM\$LOAD logical name after
installing in cluster • C-3

DELNI

See Local Network Interconnect

DEQNA

See QBUS Network Adapter

E

Ethernet

configuration restrictions • C-2

Ethernet hardware address

See Satellite node

G

Group number

See Cluster group number

H

Halting a satellite node

user action • 4-1

Hierarchical Storage Controller (HSC) device •
1-4, 2-2

I

Installation

configuring a second boot node in the
cluster • 2-17

configuring boot node for cluster
operation • 2-2

Index

Installation (cont'd.)

- installing new layered products on a boot node with two system disks • 2-16
- of DECnet-VAX key • 2-8
- of Local Area VAXcluster Software key • 2-2
- of VMS operating system • 2-1, A-1
- setting up a new cluster with two boot nodes • 2-18
- setting up a second system disk on a cluster boot node • 2-14
- setting up cluster security database • 2-2
- tailoring DECnet-VAX network • 2-8
- upgrading VMS operating system • 2-1

J

- Joining the cluster
 - user action • 4-1

L

- Layered product
 - installing on a boot node with two system disks • 2-16
 - installing on second boot node • 2-17
 - when to install • 1-3
- Leaving the cluster
 - user action • 4-1
- Local Network Interconnect (DELNI)
 - restriction for use • C-2

M

- Mass Storage Control Protocol (MSCP)
 - Server
 - See MSCP Server
- MicroVAX II processor
 - installing VMS operating system when used as cluster boot node • A-1
 - minimum DEQNA revision level requirement • 1-2
 - minimum memory requirement • 1-2
 - restrictions for use as boot node • 1-1

- Modifying a satellite node's Ethernet hardware address • 3-11
- MODPARAMS.DAT file
 - created during SATELLITE_CONFIG.COM ADD phase • 3-2
 - maintaining in Version 4.6 Local Area VAXcluster configuration • C-2
 - updating when upgrading a Local Area VAXcluster configuration to Version 4.6 • C-1
 - using AUTOGEN symbols to modify MSCP Server values • C-5
- MOM\$LOAD logical name
 - defining as search list after installation of DECserver terminal server software • C-3
- MSCP Server
 - default values for boot and satellite nodes • C-4
 - serving local disks on satellite nodes • 3-13
 - using AUTOGEN to load on satellite nodes • C-4
 - using AUTOGEN to modify values • C-4

N

- NETCONFIG.COM command procedure
 - See DECnet-VAX network
- NETNODE_UPDATE.COM command procedure
 - See DECnet-VAX network
- Network
 - See DECnet-VAX network
- Network Control Program (NCP)
 - See DECnet-VAX network

O

- OPA0: workstation operator console terminal
 - See Workstation node
- OPCOM messages
 - See Broadcast messages

Index

Optional software product

See Layered product

P

Page file (PAGEFILE.SYS)

created for satellite node during
SATELLITE_CONFIG.COM ADD
phase • 3-2, 3-4

Password

See Cluster password

Q

QBUS Network Adapter (DEQNA)

minimum revision level requirement • 1-2

R

RA series disk

used as system disk for MicroVAX II boot
node • 1-1

RD54 disk

used as system disk for MicroVAX II or
VAXstation II boot node • 1-1

RD series disk

See Satellite node

Rebooting a satellite node

user action • 4-1
if an operating system is installed on
local disk • C-2

RECNXINTERVAL parameter

adjusting to boot VAXstation II/GPX
systems from console terminal port •
C-4

Removing a satellite node • 3-9

Reporting problems

user action • 4-2

S

SATELLITE_CONFIG.COM command

procedure
functions • 3-1

SATELLITE_CONFIG.COM command

procedure (cont'd.)

preparing to execute • 3-3

required information • 3-3

system files created during ADD phase for
satellite node • 3-2

using to add satellite nodes • 3-6

using to modify satellite Ethernet hardware
address • 3-11

using to remove satellite nodes • 3-9

SATELLITE_PAGE.COM command

procedure

created during SATELLITE_CONFIG.COM
ADD phase • 3-2

used to set up page and swap files for
satellite nodes • 3-4

Satellite node

adding • 3-6

booting, user action • 3-6

breaking port-to-port virtual circuit
connections • C-7

disabling conversational bootstrap
operations • 2-7

Ethernet hardware address, modifying •
3-11

expected device error message when
adding to cluster • C-6

functions • 1-1

legal systems • 1-2

maintaining network configuration data •
3-5

modifying files in SYS\$COMMON
directory
user action • 4-1

obtaining Ethernet hardware address • 3-3

RD series disk used for local paging and
swapping • 1-1

rebooting if an operating system is
installed on local disk • C-2

removing • 3-9

restoring network configuration data • 3-5

restricted operations • 4-1

setting up page and swap files • 3-4

shutting down before removing from
cluster • 3-9

Satellite node (cont'd.)
 system files created during SATELLITE_ CONFIG.COM ADD phase • 3-2

SCSNODE parameter
 specifying during installation of VMS operating system • A-4

SCSSYSTEMID parameter
 calculating value from DECnet-VAX area number and node number • A-4
 specifying during installation of VMS operating system • A-4

Security functions
 BOOT_CONFIG.COM command procedure, using to set up cluster security database • 2-2

Cluster_Authorize Utility (CLUSTER_ AUTHORIZE)
 sample interactive session • 2-5
 using to alter cluster security data • 2-5

cluster authorization file (CLUSTER_ AUTHORIZE.DAT) • 2-5
 updating in dual system disk configuration • 2-13

controlling conversational bootstrap operations on satellite nodes • 2-7

overview • 2-4

Setup procedure
 adding a second system disk on a cluster boot node (VAX 8500 or larger) • 2-14
 configuring an extended cluster • 2-11
 configuring a second boot node in the cluster • 2-17
 coordinating cluster common files for two boot nodes • 2-11
 coordinating cluster common files for two system disks • 2-11
 installing new layered products on a boot node with two system disks • 2-16
 normal sequence • 1-2
 overview • 1-2
 setting up a new cluster with two boot nodes • 2-18

Shutdown messages
 See Broadcast messages

Shutting down a satellite node
 user action • 4-1

Swap file (SWAPFILE.SYS)
 created for satellite node during SATELLITE_CONFIG.COM ADD phase • 3-2, 3-4

SWAPFILES.COM command procedure • B-2

SYSBOOT.EXE image
 renaming before rebooting satellite if an operating system is installed on satellite's local disk • C-3

System directory
 naming • B-1

System Generation Utility (SYSGEN)
 SCSNODE parameter • B-2

System page file • B-2

U

Upgrade procedure • 2-1, B-1
 caution for performing on existing Local Area VAXcluster configuration • 2-1

contingencies • B-1

continuing • B-5

free block requirement • B-2

interrupting • B-5

messages to be ignored • C-5

network restriction • B-1

null SCSNODE requirement • B-2

performing • B-4

Phase 1 • B-6

Phase 2 • B-7

Phase 3 • B-7

Phase 4 • B-8

Phase 5 • B-8

preliminaries • B-1

preparing to perform • B-2

system page file size requirement • B-2

terminating • B-5

updating SYSSYSTEM:MODPARAMS.DAT
 files in existing Local Area VAXcluster configuration • C-1

Index

User Environment Test Package (UETP)

- expected error messages when running Ethernet test • C-8

V

VAXstation II processor

- minimum DEQNA revision level requirement • 1-2
- minimum memory requirement • 1-2
- restrictions for use as boot node • 1-1

VAXVMSSYS.PAR file

- created during SATELLITE_CONFIG.COM ADD phase • 3-2

VMSINSTAL.COM command procedure

- installing Local Area VAXcluster Software key • 2-2

- installing new layered products on a boot node with two system disks • 2-16

VMSINSTAL command procedure • B-4

Volume label

- modifying for satellite's local disk • 3-4

W

Workstation node

- controlling broadcasts to operator console terminal (OPAO:) • 3-12
- expected warning and error messages if booted before workstation software installed • C-7

Workstation software

- starting in dual system disk configuration • 2-13
- when to install • 1-3

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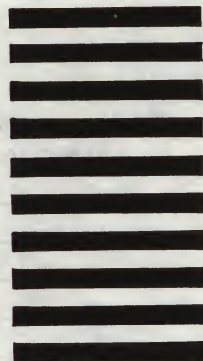
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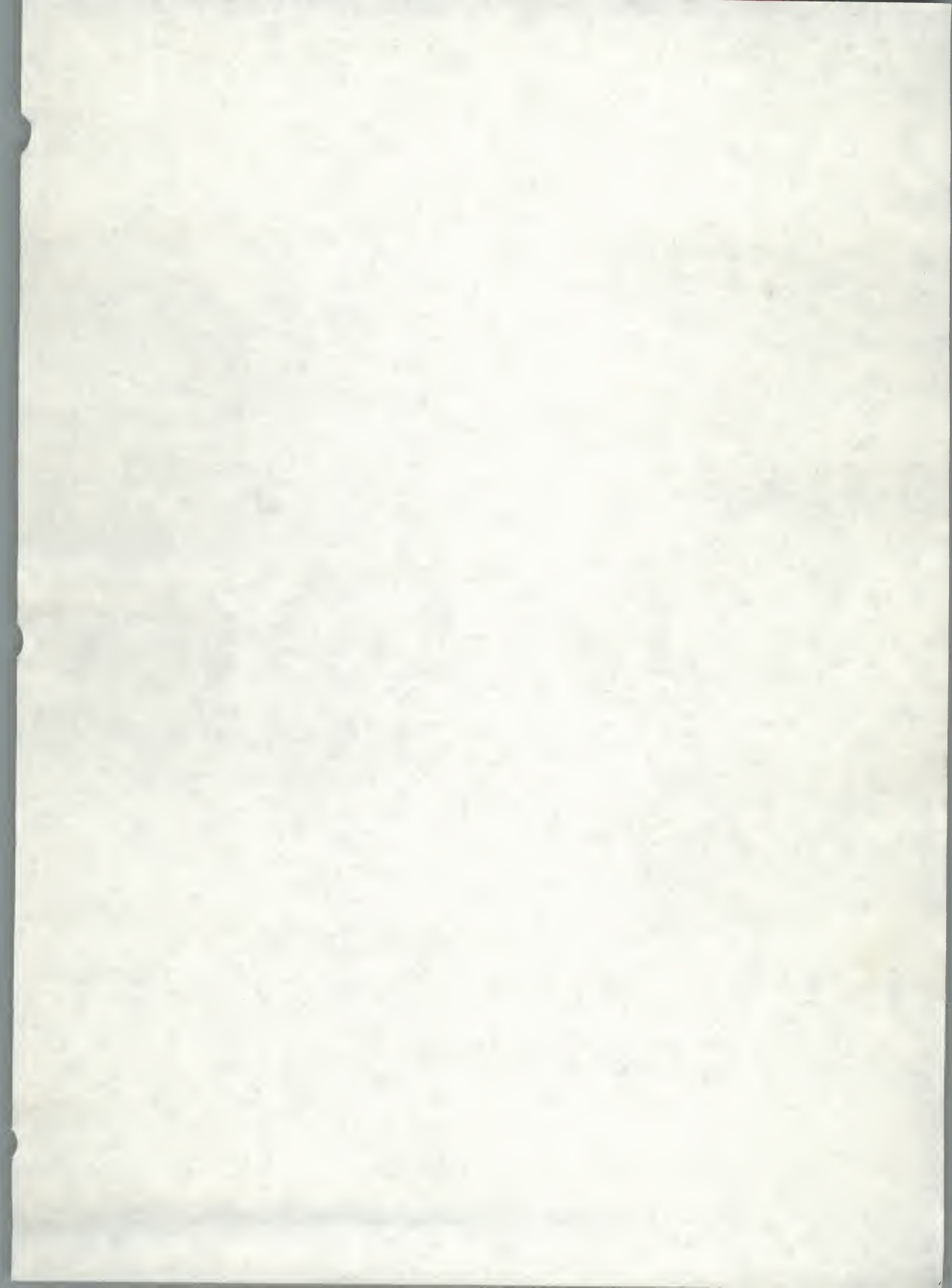
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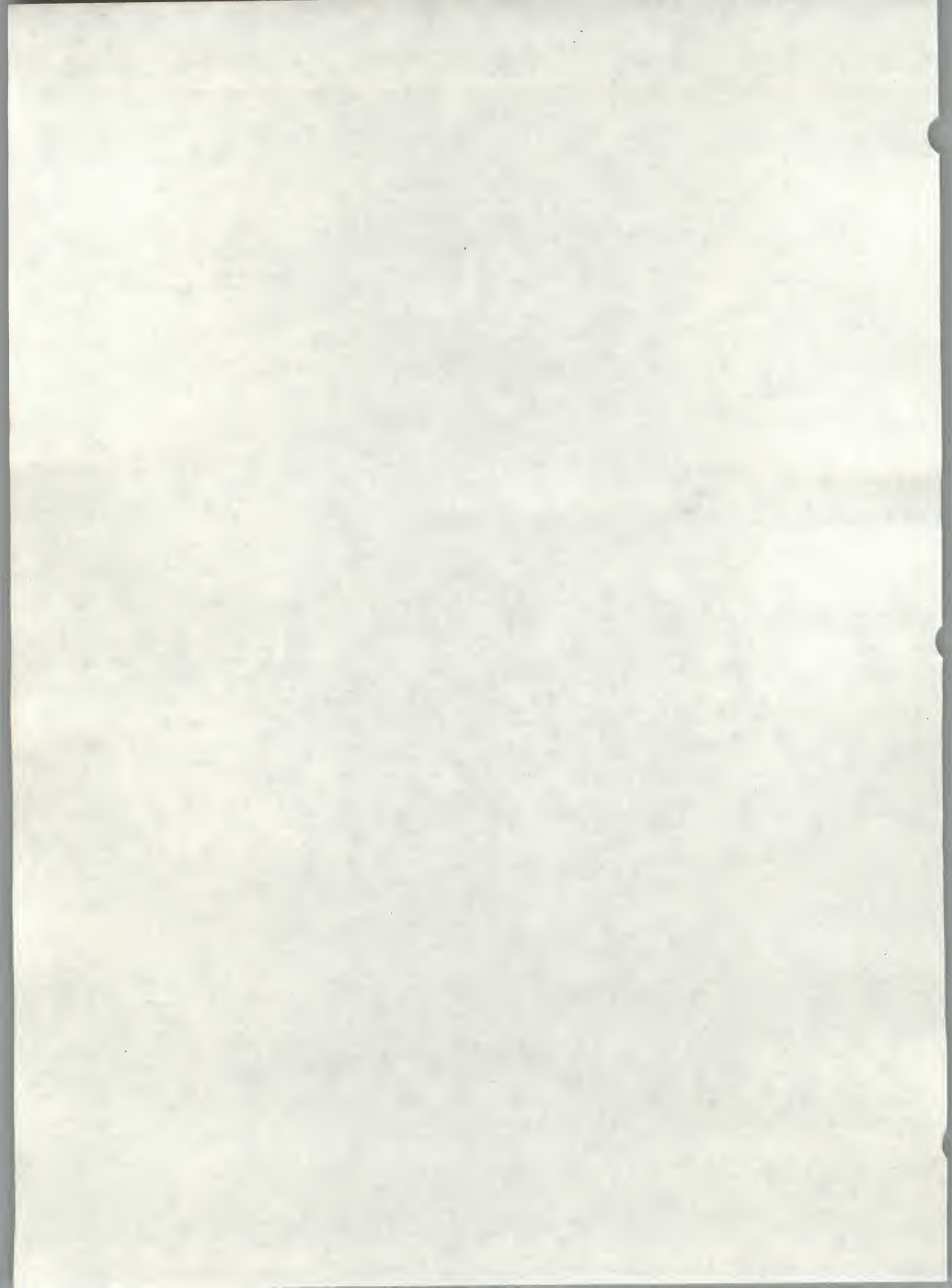
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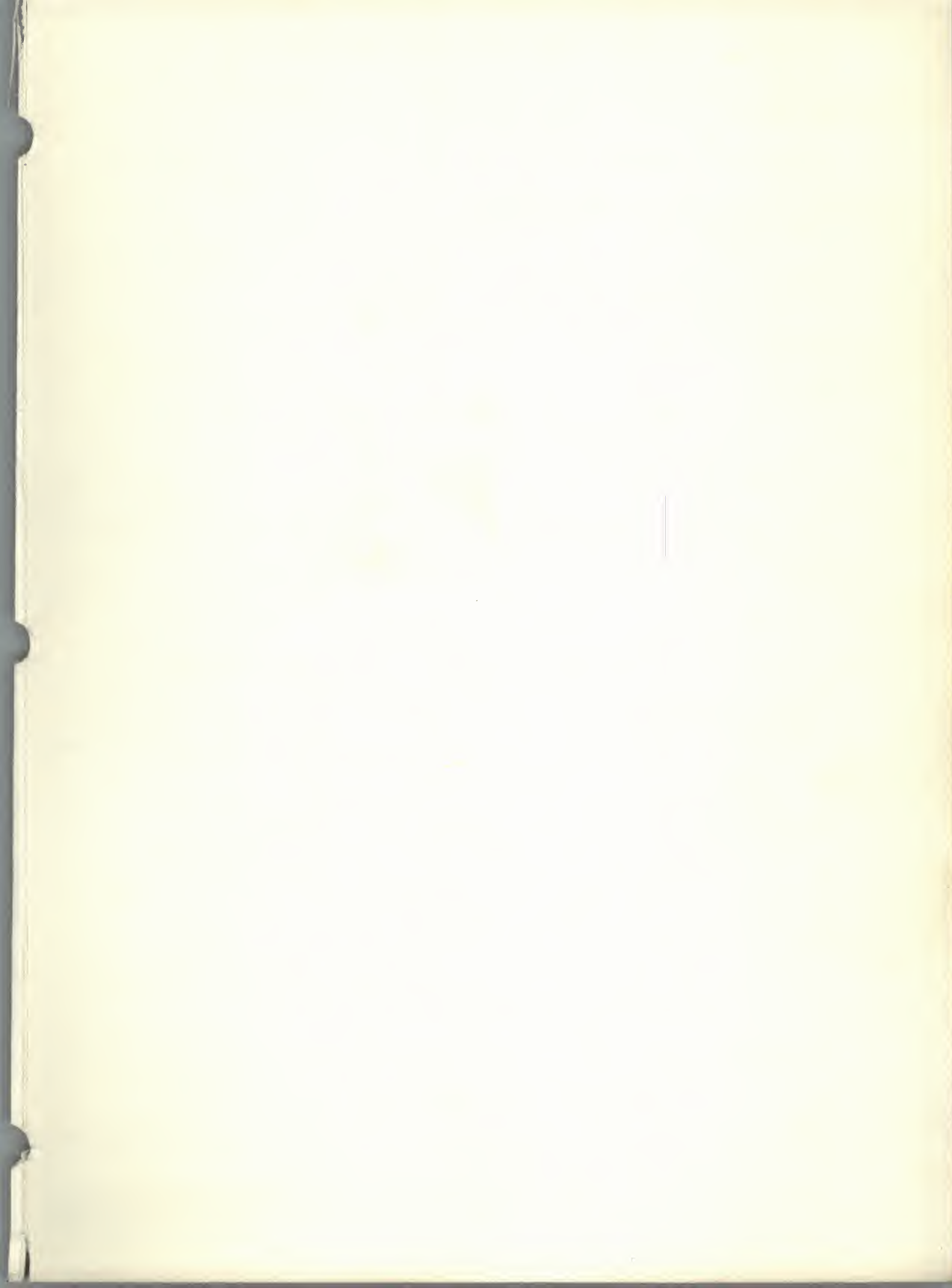


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